the OIL AND GAS JOURNAL

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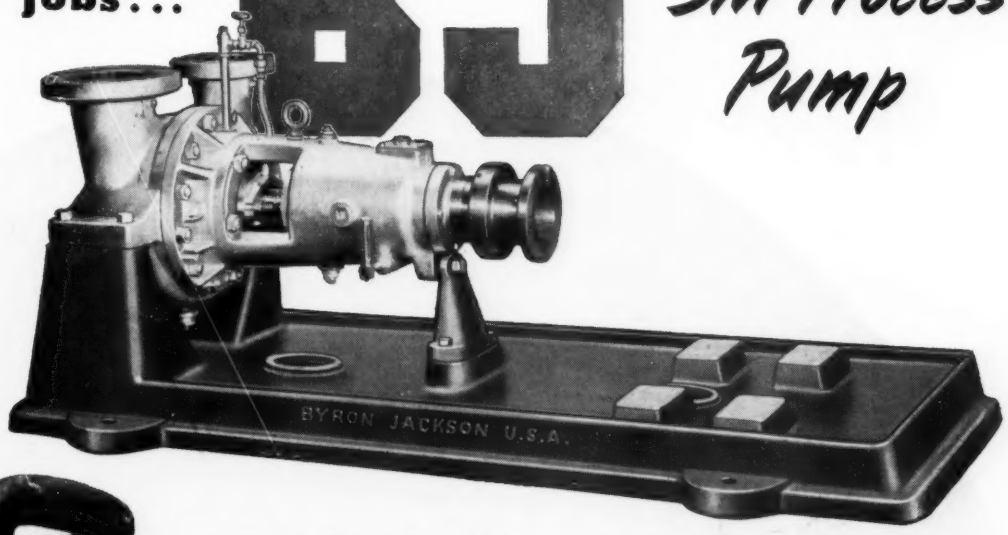

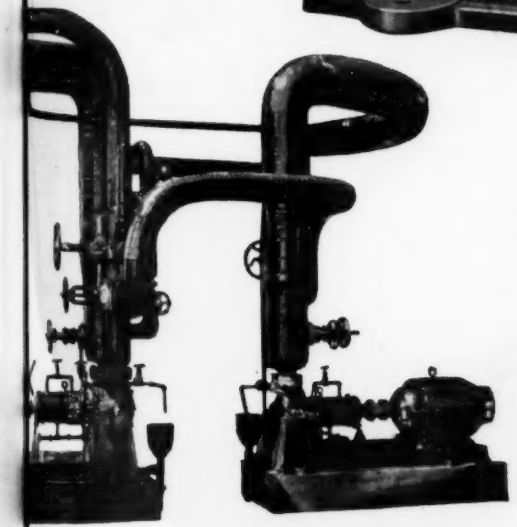

Two SM Process Pumps, installed by Refinery Engineering Co. Two-stage, Turbine-driven pump (left) operates against a 775 foot head, motor driven pump (right) against a 530 foot head. Pumping 28° API reduced crude at 550° F.

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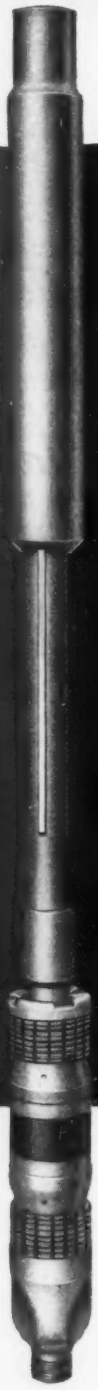

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THE OIL AND GAS JOURNAL

Secrecy Breeds Suspicion

THE war has been over for a year. The Office of Censorship folded 24 hours after the Japs did. The Army and Navy have taken wraps off scores of secret weapons, plans, and processes.

Yet the war-born habit of secrecy persists throughout much of Government, and of industry also—a hush-hush attitude which keeps the public in the dark.

Government is the public's business, and it should be conducted in a gold-fish bowl for all to see. An informed public is the foundation and chief safeguard of democracy. Government officials are prone to forget that they are working for the public and that the taxpayer has a right to know how his money is being used. Nothing that goes on in any government agency need be withheld from the public and the press except a small category of activities during their preliminary stages, such as investigation of law violations prior to filing of charges.

Secrecy is the refuge of minor bureaucrats who live in constant fear of criticism. To avoid the risk of displeasing a higher official or the taxpayers—their real bosses—they prefer to reveal nothing about their work.

There appears to be relatively little maladministration in the federal Government and less downright crookedness. What exists could be more quickly detected and corrected if government business were done entirely in the open. The several current congressional investigations into the accounting and operating practices of various agencies are revealing conditions that might not have existed had there been less secrecy.

The relations of the oil and gas industry with the Government will be improved if all parties keep their cards on the table. To cite a single example, the Interior Department is organizing two new agencies, the Bureau of Land Management and the Oil and Gas Division, which will impinge on many industry operations. Full details of their plans should be told the industry as they develop and, conversely, the industry should openly tell its desires and fears.

This principle applies with even greater force to the National Petroleum Council. Secrecy in its operations can only breed public suspicion of undue influence on the Government and of an antitrust conspiracy among the members.

The oil industry also should rid itself of the wartime secrecy surrounding its operations, plans, and processes. The public has a stake in a progressive, efficient, competitive oil industry, and a well-run corporation has no more to fear from public scrutiny than a well-run government bureau.

Wherever it exists, secrecy is the mother of suspicion.

Board Decisions Indicate Continued Decontrol for Petroleum

by Henry D. Ralph

WASHINGTON. — The pattern for price control set last week by the Price Decontrol Board and the Office of Price Administration make it very unlikely that there will be any move toward recontrol of petroleum prices.

Now that the board has disposed of the four groups of commodities on which it had to act before August 21 there has been some thought that it would turn its attention immediately to the three groups—petroleum, tobacco, and poultry and eggs—which Congress directed are to remain free from control unless and until the board decides otherwise.

However, there is no indication whatever that the board is taking any steps toward investigating these commodities on its own initiative, nor that OPA nor any other group has complained about increased oil prices. OPA officials privately admit that oil price increases do not appear to be unreasonable, on the whole, and while they will keep an eye out for instances of consumer gouging they are under no pressure to roll back oil prices.

After 4 days of hearings and several more days of intensive study the Decontrol Board ordered OPA to restore price ceilings on livestock and meats, and soybeans and cottonseed products, but left dairy products and almost all grains free from controls. In doing so, it gave a clue to the way it will interpret and apply Congress' instructions in future proceedings.

Milk, it said, is in short supply and a low price for it is in the public interest, but, while in some cases recent price rises have been unreasonable, in general the industry has shown restraint and prices have not risen unreasonably above the old OPA ceilings plus subsidy.

Other Board Findings

The board found the supply of soybean and cottonseed products to be extremely short and their current prices unreasonably high. The supply of grains, except flaxseed, will be in ample supply when the new harvest is completed, and future prices on the commodity markets are already going down, the board found.

The board's decision on meat has aroused the most controversy. In addition to finding that price increases are "beyond question unreasonably above ceilings plus subsidies," it said that "the supply of meat has been and will continue to be short in relation to demand at reasonable prices." Critics point out that the law says nothing about supply being in relation to demand at reasonable prices and declare that under this theory the supply of any commodity could always be kept short by forcing down the price to increase the demand.

However true this may be with respect to a commodity with a flexible demand like top grades of meat, it probably has little bearing on petroleum where the consumptive demand, short-range at least, is not much affected by price fluctuations.

In view of these Decontrol Board decisions it seems highly improbable that anyone could make a convincing case that petroleum products are in short supply or that their prices have risen unreasonably since OPA controls were removed on June 30.

Contract Let for $900,000 California Gas Pipe Line

LOS ANGELES.—A contract for construction of a $900,000 natural-gas pipe line from Pittsburg, Calif., near San Francisco to the Suisun Bay, Kirby Hill, and West Rio Vista gas fields has been awarded to Pacific Pipe Line Construction Co., Los Angeles.

The line will be built for Pacific Public Service Co. It will have capacity of 65,000,000 cu. ft. daily and will connect with the existing Stanpac line in which Pacific Public Service has a five-fourteenths interest. The project will be completed this year.

Indiana Standard Signs With Striking Seamen

Settlement of a strike against the Denver Producing & Refining Co., and an agreement between the C.I.O. National Maritime Union and Standard Oil Co. (Ind.) in the Great Lakes shipping strike featured labor news of interest to the oil industry last week.

In Oklahoma City, striking employes of Denver Producing & Refining Co. and officials of the company reached an agreement, details of which were undisclosed, and operations of the company's 46 wells and refinery in the West Edmond field were resumed. The workers walked out August 18 after lay-off of two employes. The company contended that the dismissals were part of a general personnel reduction.

The Great Lakes seamen's strike appeared headed for settlement, as N.M.U. members in 18 ports ratified an agreement with Standard Oil Co. (Ind.) calling for a work week of 48 hours at sea and 44 hours in port. Seamen of the company's 5 tankers were directed to return to their posts. A similar offer by Bethlehem Transportation Co. of New York was expected to be ratified by the 2,500 striking seamen. Indiana Standard's agreement was expected to become a pattern settlement.

Shell to Build Marine Terminal in St. Louis

ST. LOUIS. — A marine terminal and bulk storage plant of 4,350,000-gal. capacity will be built by Shell Oil Co., Inc., on a 30-acre river-front tract in North St. Louis, E. R. Page, division manager of operations for the company, announced last week.

The cost of the installation will be about $525,000, Page said, and 60 per cent of the storage facilities will be used for domestic and industrial fuel oil coming from the nearby Shell refinery at Wood River, Ill. The remainder of the capacity will take gasoline and lubricating oils. Construction is to begin as soon as the necessary permits are granted and the required building materials can be obtained.

California Standard Tanker, F. S. Bryant, Launched

CHESTER, Pa.—Standard Oil Co. of California's S.S. F. S. Bryant, first large tanker to be designed and built postwar in the United States and named for a company vice president and director, was launched here August 27.

Officials of both Standard and Sun Shipbuilding & Drydock Co., builders, participated in the ceremonies. The vessel was christened by Mrs. Bryant.

A variety of war-tested innovations are embodied in the vessel. Seven pumps and seven cargo-piping systems permit high-speed loading and unloading. Cargo capacity of the 8,300-ton, 442-ft. vessel is about 102,000 bbl. Nearly 20 different petroleum products can be transported in bulk in the ship's 27 individual bulk-cargo compartments. A sister ship, the R. G. Follis, named for California Standard's president, is scheduled for launching in October.

Motor Accidents at Highest Peak Since 1941, A.P.I. Report Shows

NEW YORK.—Oil-industry motor-vehicle accidents in 1945 increased 28.6 per cent over 1944 and showed their highest frequency rate since 1941, according to the annual compilation of the Department of Accident Prevention of the American Petroleum Institute.

The department said that depreciation of equipment over the war years was probably responsible for a part of the increase in traffic accidents, but the high rates reported for 1945 constitute "a definite challenge" to those responsible for the maintenance and operation of motor vehicles in the petroleum industry.

In response to the institute's request for information concerning traffic accidents, 151 companies operating 49,986 vehicles reported their experience for the year 1945. However, 48 of the reporting companies were unable to give data on the mileage traveled by their vehicles and their reports are summarized in the accompanying table on "accidents per 100 vehicles" only.

The balance of 103 oil companies reporting operated 45,520 vehicles over a distance of 644,954,636 miles during the year. These vehicles had 1.28 accidents in each 100,000 miles, or 1 accident per 77,893 miles of travel. During 1945 the 18,824 passenger cars reported traveled 126,868 miles to each accident; the 26,316 trucks averaged only 59,554 miles of travel to each accident.

A breakdown of the survey, dealing with the 103 companies, and showing accidents per 100,000 miles of driving, follows:

	1945	1944	1941
All departments:			
Passenger	0.79	0.69	0.89
Trucks	1.68	1.25	1.77
Refining:			
Passenger	1.42	1.54	1.69
Trucks	1.78	2.51	1.99
Marketing:			
Passenger	1.02	0.99	1.04
Trucks	1.91	1.37	1.90
Production:			
Passenger	0.48	0.43	0.58
Trucks	0.78	0.66	0.92
Pipe line:			
Passenger	0.53	0.42	0.72
Trucks	0.72	0.58	0.85

A breakdown on the 48 companies which were unable to give data on the mileage traveled by their vehicles, showing accidents per 100 vehicles, follows:

	1945	1944	1941
All departments:			
Passenger	11.8	9.7	16.9
Trucks	22.9	17.2	27.7
Refining:			
Passenger	17.4	17.0	24.4
Trucks	17.9	21.6	14.8
Marketing:			
Passenger	13.3	11.2	19.2
Trucks	27.7	20.6	31.8
Production:			
Passenger	9.3	8.8	12.7
Trucks	8.9	7.5	10.5
Pipe line:			
Passenger	8.9	6.8	13.9
Trucks	10.2	5.9	13.0

Basis of the report on accidents was any accident in which a motor vehicle in company service is involved, unless properly parked, which results in death, personal injury, or property damage regardless of who is hurt, what property was damaged or who was considered responsible.

Crude Exports, Imports Show Gain in June

WASHINGTON. — An increase in both exports and imports of crude petroleum during June and in the 6 months ending June 30, a sharp drop in exports of motor fuel and gasoline this year, and a decrease in both exports and imports of gas oil and fuel oil, are disclosed in the monthly Department of Commerce report on foreign trade.

Details are shown in the following tables:

Commodity:	June 1946	June 1945	Per cent change	First 6 mo. 1946	First 6 mo. 1945	Per cent change
EXPORTS (1,000 bbl.)						
Crude oil	3,401	2,988	13.8	18,036	14,689	22.8
Motor fuel and gasoline	2,196	9,379	76.6	21,636	60,973	64.5
Gas oil and fuel oil	4,035	5,673	28.9	19,533	22,662	13.8
IMPORTS (1,000 bbl.)						
Crude oil	6,268	6,090	2.9	43,901	31,673	38.6
Gas oil and fuel oil	4,379	4,431	1.2	24,512	26,268	6.7

Scrap Still Urgently Needed, CPA Says

WASHINGTON. — Officials of the Civilian Production Administration last week termed the response of the oil industry to the iron and steel scrap-collection drive "most gratifying," but at the same time said more material is urgently needed.

"An increase in the flow of scrap to the mills and furnaces is noted. However, the amount falls far short of meeting requirements; it is reported that mill receipts of iron and steel scrap are only 60 per cent of the current consumption rate," said Edward W. Greb, salvage officer of the CPA's bureau of industry operations.

"Accordingly greater action is necessary on the part of all concerned if present production rates of steel are to be maintained." Greb asked individual companies in the petroleum industry to "survey all plants and properties for dormant scrap" — if not already done. "Designate an individual with authority to turn out all obsolete equipment and pass judgment on the fate of idle equipment," he said. "Urge him to start the scrap flowing and keep it going."

J. D. Small, CPA head, several weeks ago enlisted the oil industry's cooperation to meet a dangerous scrap shortage that threatened continued operations of steel mills. He asked that the industry resume scrap collection on a wartime scale.

U.S. Tax Receipts on Oils And Gasoline Show Gain

WASHINGTON.—Internal revenue collections on lubricating oils totaled $9,071,041 in July, an increase of $2,831,942 over June, but a decrease of $4,622,998 compared to July 1945, the Bureau of Internal Revenue announced last week.

Revenue from gasoline tax collections was listed at $36,622,309, an increase of $1,595,405 over the June figure of $35,026,904, and the July 1945 total was $39,517,894. Tax collections from transportation of oil by pipe line totaled $1,392,506, as compared to the July 1945 figure of $1,328,144.

Gas Waste Committee Says Existing Rules Sufficient

KILGORE, Tex.—At a meeting last week of the East Texas Field Gas Committee, appointed by the Texas Railroad Commission to study casinghead-gas waste, a recommendation was made to the commission that a general order letter be written to all producers and pipe-line carriers in the field, calling their attention to the rules and regulations now in effect, pertaining to production of oil and gas in East Texas field.

R. F. Morgan, member of the committee, said the committee decided adherence to existing rules would stop waste of unprocessed rich gas by gasoline plant flares. "Such cooperation would also tend to give an even flow of flared residue gas which would eliminate the principal objection that the industrial gas purchasers have heretofore given as their reason for not wanting to purchase this residue gas from the gasoline plants," he pointed out.

Petroleum Division, A.C.S. To Mark Anniversary

NEW YORK. — More than 1,000 chemists from oil industry laboratories and the nation's technical schools are expected in Chicago the week of September 9 to celebrate the twenty-fifth anniversary of the organization of the Petroleum Division of American Chemical Society.

DR. S. S. KURTZ, JR.

Numerous addresses dealing with problems of the industry will be delivered at sessions to be held in connection with the society's 110th national meeting, according to an announcement by Dr. Stewart S. Kurtz, Jr., of Sun Oil Co., chairman of the division. Bruce K. Brown, Chicago, general manager of research and development of Standard Oil Co. (Ind.), will speak on "Petroleum From 1921 to 1971" at a dinner on Tuesday evening, September 10.

Dr. Charles L. Thomas, research director of Great Lakes Carbon Co., Chicago, is directing arrangements for the celebration. Dr. Thomas is vice chairman of the division, which with 1,300 members is the largest of the society's eighteen professional divisions.

A survey of the progress of petroleum research in the last 25 years, and a forecast of the next 25 years, will feature a special program celebrating the anniversary meeting.

Other Topics for Discussion

Testing catalysts, the mechanism of catalytic cracking, hydrogenation, and the properties of catalytic products, and the composition of hydrocarbon fractions are among the several important subjects to be discussed before the semi-annual meeting of the Petroleum Division. Recognizing the tremendous and rapidly increasing importance of catalysis in petroleum refining, the program has been developed around a group of four papers on cracking catalysts and products from catalytic cracking reactions.

Determination of aromatics, olefins, and other constituents of motor and aviation fuels and methods for obtaining these data will also be presented at the meeting. These developments indicate the greatly increased importance of these products in light-fuel refining. Further results from the prolonged research of the Bureau of Standards into the composition of petroleum light fractions and the properties of these constituents are to be reported by F. D. Rossini and several colleagues, who will present recently developed data on the purification and properties of 48 paraffins, 11 aromatics, and 7 olefinic hydrocarbons. An interesting feature of this work is the description of the purification and sealing, in vacuum, of 19 National Bureau of Standards samples of pure hydrocarbons, including paraffins, cycloparaffins, and aromatic compounds ranging from normal pentane to isopropylbenzene.

An extended report will be made by Dr. Cecil Boord and several collaborators on the use of the Grignard reaction, using organo-magnesium halides in the synthesis of pure hydrocarbons, in the extended American Petroleum Institute research program which has been carried on at Ohio State University on the composition of petroleum fractions. More than 150 hydrocarbons have been synthesized and/or purified in this program. The Chicago Chemical Exposition is being held in conjunction with the meeting of the society.

Production Records Set At Aruba Plant

A VARIETY of production records fell during July at the Lago Oil & Transport Co., Ltd., refinery on the Island of Aruba off the coast of Venezuela.

During the month, the refinery's 7,500 employes handled a total of 11,059,000 bbl. to surpass the old mark of 10,403,000 bbl. set the previous month. The July daily average was nearly 357,000 bbl.

Three Other Records

As the plant stepped up its operations to meet postwar demand for petroleum products, three other record performances were turned in. They were: daily crude run, 416,000 bbl., July 23; monthly crude and product receipts, 11,651,000 bbl.; and crude product shipments, 12,012,000 bbl.

The Lago Oil & Transport refinery on Aruba is considered the largest refinery in the Western Hemisphere. The company is an affiliate of Standard Oil Co. (N. J.) The plant processed its billionth barrel of crude March 15, 1945, after 16 years of operation, becoming the world's first refinery to achieve this total, the company said. From January 1, 1942, through August 31, 1945, Aruba produced 452,000,000 gal. of high-octane gasoline, supplying 20 per cent of high-octane requirements of the Allies, according to the company announcement.

The fluid catalytic cracker (left background) and other units for producing high-octane fuel at the Aruba refinery of Lago Oil & Transport Co. The West Indies island plant during July exceeded four of its own production records

THIS 1946 WEEK

S M T W T F S

NATURAL GAS—Kansas Corporation Commission intervenes in Michigan-Wisconsin Pipe Line case now being heard by FPC. . . . Kansas statement contends excessive gas exports from Hugoton field are depressing field gas price. . . . Asserts Hugoton gas selling below its value because of "transportation to distant markets for base uses in competition with cheaper fuels." . . . Decision on Michigan-Wisconsin's proposed $84,000,000 gas pipe line not expected for month or two. . . . ¶Committee named by Texas Railroad Commission to study gas waste in East Texas field tells commission adherence to existing rules would halt flaring of unprocessed rich gas. . . . ¶Interstate Oil Compact Commission plans drive for adoption of uniform natural-gas measurement base of 14.65 psi. for use in reporting production. . . .

PRODUCTION—Daily allowable of 270,000 bbl. in Kansas continued unchanged through September. . . . ¶U. S. output in week ended August 24 drops 12,209 bbl. to total of 4,847,909 bbl. daily. . . . California production down 13,100 bbl. daily. . . . ¶Well completions in the August 24 week jumped to 577—66 over preceding week. . . .

REFINING—English inventor discloses development of fuel-purifying plant for ships claimed able to permit use of low-grade, impure crude in diesel engines. . . . ¶Two plants planned to use heavy crudes produced in Alberta and Saskatchewan. . . . One 1,000-bbl. daily plant to produce lubricants from Lloydminster crude. . . . Second plant, under consideration by Husky Refining Co., will produce asphalt. . . . ¶Sohio Petroleum reveals plans to build $8,000,000 lubricating-oil plant at Toledo. . . . ¶Lago Oil & Transport reports Aruba refinery processed 11,059,000 bbl. in July with record daily crude run of 416,000 bbl. July 23. . . .

PRICES—Crude purchasers and small producers still await government decision on future rates of payment under stripper-well subsidy. . . . Necessity of further legal work on documents involved now reported holding up announcement. . . . ¶Petroleum markets generally steady with few minor price adjustments on East and West Coast, particularly on fuel oil. . . .

INTERNATIONAL—Creole's production in Venezuela sets new record in July with daily average of 580,053 bbl. ¶British Government takes steps to encourage industrial conversions from coal to oil to be supplied from Middle East. . . . Government announces import duty of 2 cents per gallon on fuel and gas oil will be removed next year.

CONSUMPTION—U. S. exports and imports of crude and products both show gain in June over June of last year. . . . Crude imports up 13.8 per cent, exports, 2.9 per cent. . . . ¶U. S. gasoline tax collections in July reported at $36,622,309, up $1,595,405 over June. . . .

GOVERNMENT—Recent broadcast of John A. Loftus and Charles B. Rayner, State Department officials, and Col. G. H. Vogel, ANPB executive, brings sharp criticism. . . . I.P.A.A. report says philosophies expressed by speakers have "proven false in the past." . . . Senator O'Mahoney labels some statements as "absurd." . . .

The tanker Yellow Tavern docked at Philadelphia August 18 with the first shipload of Middle East crude ever to reach the United States. The tanker is shown here being pushed toward the dock with its 115,000 bbl. cargo. Gulf Oil Corp. brought the crude from Kuwait—where Gulf Exploration Co., a subsidiary, jointly holds a concession with Anglo-Iranian Oil Co., Ltd.—to its Philadelphia refinery for test runs which were to begin this week. In the inset picture are Willard F. Jones, general manager of Gulf's marine department, and A. J. Zera, the Yellow Tavern's captain. Details on the arrival of the tanker were published in The Oil and Gas Journal, August 24, page 64

International

WORLD-WIDE OIL DEVELOPMENTS

Colombian President Asks Intensive Oil Development

BOGOTA. — Indicating the attitude of Colombia's new president, Dr. Mariano Ospina - Perez — who took over the reins of office August 7— on future petroleum activities here, is his inaugural statement to the effect that he favors an intense development of his country's oil resources.

Backing up the new president, his newly appointed minister of petroleum, Dr. Luis Buenahora, stated that the 1945 oil report, summarizing Colombian oil activities for the past 15 years, "is in indication of the extraordinary importance which the development of the oil industry has in the national economy." He also stated that "it is a sign of the equity and justice contained in our tax laws and the propér guarantee should be given to oil capital so as to permit it to obtain reasonable profits."

Concerning the projected oil law (The Oil and Gas Journal, June 22, page 64), which Congress is to consider during the current session, Buenahora stated that "the Government has been prudent in submitting to Congress a bill calling for a slight upward increase in the royalties and surface exploratory fees," concluding, however, that the Government should in no case establish levies which may endanger the stability and future developments of the industry.

The Colombian Minister of Petroleum believes that his country must establish a definite oil policy to give stability to the oil industry, and he states that the projected oil bill should be a flexible instrument adjusted to oil markets and the present world situation.

Following is a summary of the recently released Colombian oil report which covers activities during the past 15 years:

Concerning bids, 455 concession bids were filed (up to May of this year), of which the ministry found 181 in order and were formally accepted. This equals 40 per cent efficiency, with 154 bids still being studied. Colombia's present legal requirements are generally regarded as a "bottleneck" and one which the projected oil law may partially correct. Since 87 bids were filed in 1945, the indicated lag between filing and acceptance is from 1½ to 2 years. To date, 18,741,601 hectares (46,291,755 acres) of prospective oil land has been the object of bids and concessions. This may be about 90 per cent of Colombia's prospective oil land. For instance, 842 leases cover 1,213,-280 hectares (3,033,200 acres).

Thirty-two oil concessions are now in force covering 2,444,315 hectares (6,037,458 acres). Fifty-five concessions have been granted, with two under special contracts—De Mares in 1919 and Barco in 1931. Of the remaining 53 covering 2,485,713 hectares (6,139,711 acres), 23 have been surrendered because of "not having found oil in commercial quantities." Those surrendered covered 740,203 hectares (1,828,301 acres), 30 per cent of the total acreage.

Output of Concessions

The 30 grants in force cover 1,745,-410 hectares (4,311,410 acres). Only one concession of the 53, Yondo, of the grants has found commercial oil.

The three commercial oil concessions—De Maries, Barco and Yondo—had a crude output for 1945 as follows: De Mares, 15,649,360 bbl.; Barco, 5,540,221 bbl.; and Yondo, 1,635,-447 bbl., or a total for Colombia of 22,825,028 bbl. This was 0.28 per cent of the world crude output in 1945.

Colombia's gross production, 1921-1945, totals 371,567,129 bbl., of which 323,634,829 bbl., or 87 per cent, was exported and brought a weighted average price, f.o.b., of $1.13 per barrel.

In 1945, the oil industry in Colombia contributed 11.6 per cent of the 1945 fiscal revenues, broken down as follows: royalties and surface fees, Ps 4,254,058 ($2,424,813); consumption tax on motor fuel and lubricants, Ps 5,962,200 ($3,398,454); income taxes, Ps 9,636,165 ($5,492,614). The value of Colombia's 1945 oil exports was $22,234,789. The fiscal income is 50 per cent of this value.

Colombia's oil industry employed 14,981 with only 899, or 13 per cent, classed as foreigners. The wage and salary outlay was the highest registered since 1939 when it was Ps 24,-447,451 ($13,900,000), and compares with 1944 of Ps 21,086,578 ($12,000,-000). The 1945 salary and wage outlay was Ps 30,263,846 ($17,250,392) which is more than half of the total oil cash imports for 1945 when the imports amounted to $31,929,755. The personnel was classified as 6,976 employes and 8,005 workers.

Provisions of "Rider"

Data also show during the first 6 months of this year, Colombia's Ministry of Mines and Petroleum has granted eight oil concessions under terms of Oil Law 37 of 1931, plus the "rider." The "rider" provides that when and if Colombia's projected revision of the oil law passes, that the companies will pay higher surface rentals during the exploration periods; 2 per cent higher royalties; and make a 25 per cent down payment as an initial concession tax, with the remaining 75 per cent to be paid if commercial oil is produced. (See The Oil and Gas Journal, June 22, page 64).

The concessions, area in hectares (1 hectare equals 2.47 acres), general location, and company holding the concession, are:

El Paso, 21,598, Caribbean, Compania Petrolera del Zulia.

Chaviva, 199,996, Llanos, Compania Petrolera del Cauca.

San Antoio, 35,062, Upper Magdelana Valley, Caldas Petroleum Co.

Guachiria, 194,138, Llanos, Compania Petrolera de Guayuriba.

All four companies above are subsidiaries of the Tropical Oil Co., which in turn is a subsidiary of International Petroleum Co., Ltd.—Standard Oil Co. (N. J.)

Macarena, 99,510, Llanos, Compania de Petroleos La Perla de Colombia, S.A.

Cimitarra, 49,900, Mid-Magdelana Valley, Compania de Petroleo del Cimitarra, S.A.

Both of the above companies are subsidiaries of Compania de Petroleo Shell de Colombia.

Aguas Claras, 9,500, Mid-Magdelana Valley, Sociedad de Fomento Petroleo—a subsidiary of Socony-Vacuum Oil Co.

Remolino, 49,723, Caribbean, Sindicato Ganadaro Colombiano—a subsidiary of The Texas Co.

Creole's July Output At 580,053 Bbl.

NEW YORK. — Still another new high for Creole Petroleum Corp.'s Venezuelan production was reached in July when the average daily output was 580,053 bbl., with 425,974 bbl. coming from Lake Maracaibo area and Cumarebo, and the remaining 154,079 bbl. from eastern Venezuela. June's daily production was 570,040 bbl.

The average daily refinery output was also increased in July to 68,300 bbl. compared with 61,845 bbl. in June. At the Caripito refinery, 58,502 bbl. were refined daily in July, with the remaining 9,798 bbl. daily being refined at La Salina.

The daily average crude production for July 1945 was 504,163 bbl., with 340,770 bbl. coming from Lake Maracaibo area and Cumarebo, and 163,770 from eastern Venezuela.

Eighteen oil wells were completed in July, compared with 14 in June, with only one gas well and one dry hole. The fields where these wells came in, their average initial production and average depth follows: Jusepin, seven, 520 bbl., 4,906 ft.; B.C.F. (Bolivar Coastal), five, 466 bbl., 3,774 ft.; Mulata, three, 253 bbl., 6,188 ft.; Quiriquire, two, 720 bbl., 4,474 ft.; and San Joaquin, one, 632 bbl., 6,400 ft. The gas well was brought in at the Guarico field at 5,709 ft. The one dry hole was in the Quiriquire field.

East Central Peru Test Drilling Around 800 Ft.

The first drilling operation attempted since the start of World War 2 in the Agua Caliente field in east central Peru is progressing at around 800 ft. The new well being drilled by Cia. de Petroleo Ganso Azul, Ltd., is approximately 1,000 ft. southeast of No. 5 producer.

Before the war interrupted development of the 90,000-acre concession which was first proven productive in 1939, Ganso Azul had completed six producing wells and had built a 500-bbl. skimming plant which supplied lease requirements and the limited interior market. The refinery is now operating at the rate of 300 bbl. per day and production is being drawn exclusively from three flowing wells. The wells on production are Nos. A-1, 4 and 5.

In earlier phases of operations, development drilling was supervised by Drilling & Exploration Co. of America. This function has been assumed now by Ganso Azul with Edgar Clayton, vice president and resident manager. E. T. Foley of Pasadena, Calif., is president of the company.

Production from the Agua Caliente field averages 45° A.P.I. gravity crude oil and is obtained from the Cretaceous at depths ranging from 1,200 to 1,350 ft.

Acquisition of materials and personnel in the United States for assignment to the Peruvian operations of Ganso Azul are handled by Investment Operating Corp., Pasadena, a management concern which services several other petroleum accounts.

Working Agreement Seen In East Indies Conflict

BATAVIA, Java.—Economic necessity may result in some kind of a working agreement between the Dutch and the politically upset Indonesians in the Netherlands East Indies by the end of this year, according to authorities here who point out that oil company representatives are now actively engaged in the Palembang area of south Sumatra in rehabilitation plans.

At present, N.E.I.'s two main islands, Sumatra and Java, continue to be dominated by the natives who are holding out for better terms with the Netherlands' spokesman, Dr. Hubertus J. van Mook. N.E.I.'s principal refineries are located on Java and Sumatra, although millions of dollars will have to be spent to bring these refineries back to prewar conditions.

The two large refineries on Sumatra belong to Nederlandsche Koloniale Petroleum Maatchappij, a subsidiary of Standard-Vacuum Oil Co., and Nederlandsche Koloniale Petroleum (Shell). On Java both companies operated small skimming plants, in addition to which Shell owned a 14,000-bbl. daily skimming and cracking unit at Tjepoe.

Lavadenz Out, But YPFB Plans Expected to Stand

NEW YORK.—Although Jorge T. Lavadenz is no longer president of Yacimientos Petroliferos Fiscales Bolivianos (Bolivian Government Oil Fields), all indications here are that Bolivia's $17,000,000 pipe-line and construction plans will go ahead as planned.

Lavadenz, who recently spent several weeks in the United States working on his country's industrial development program, went out of office as a result of the recent political upheaval in Bolivia. Guillermo Mariaca, vice president and general manager of YPFB seems to be the most likely candidate to succeeds Lavadenz. For many years prior to his YPFB affiliations, Lavadenz was employed by Standard Oil Co. of Bolivia.

Two shiploads of construction materials have already been sent to Bolivia from the United States, and Williams Brothers Corp. engineers have completed survey work on 100 miles of the 340-mile pipe-line route from the oil fields of Camiri to Cochabamba, site of the refinery which is to be build by Foster Wheeler Corp. Twenty-two miles of right-of-way have also been finished.

Union's Paraguay Wildcat Drilling Around 2,000 ft.

Drilling has progressed to around 2,000 ft. on Union Oil Co. of California's first wildcat operation on its concession in Paraguay. Union 1 Santa Rosa is in the west central part of the Chaco, about 40 to 45 miles from the Bolivian-Paraguayan border.

Contract for the well is held by Drilling & Exploration Co. of America, Los Angeles and Dallas. Drillers were sent from this country along with essential supervisory personnel but a majority of the drilling crews are Paraguayans.

Western Geophysical Co. is operating two crews on the concession under contract with Union Oil Co. The geophysical survey will continue indefinitely.

British Oil Mission to Tour Caribbean Area

LONDON.—A 10-member oil mission representing principal oil firms of Great Britian will depart soon for Caribbean oil countries to promote trade. The trip, sponsored by the Ministry of Fuel and the Commerce Office, and headed by G. L. Bolsover, director and chief metallurgist of Samuel Fox & Co., Ltd., will include visits to Trinidad, Venezuela, Colombia, and the Netherlands West Indies. Bolsover said it is hoped that in the near future Great Britain will be able to furnish much oil-field machinery and equipment to Caribbean oil countries.

British Club Invites Americans

LONDON.—Americans visiting Great Britain on business or pleasure can obtain membership in the Oil Industries Club of Great Britain by communicating with F. H. Coe, club secretary, at 26 Portland Place, London, W. 1. The club meets once monthly for lunch at the Connought Rooms, Kingsway, London, W.C.1., and all oil-industry visitors from overseas areas are welcome, according to Walter R. Skinner, secretary of the Oil Industries Club Golfing Society.

This view shows a section of the waterfront at the Abadan refinery

International Politics Background Of Iranian Concession History

by Lester S. Thompson

This is the first of two articles dealing with the history and development of oil concessions in the Middle East. The second will discuss concessions in Middle East countries other than Iran. The author, Lester S. Thompson, is a geologist who has spent a number of years in the Persian Gulf area. He has been associated with Sinclair Oil Corp., Standard Oil Co. (N. J.), and Iraq Petroleum Co., Ltd. During the war, he was with the Persian Gulf command in charge of petroleum activities. An earlier article by Thompson on the geology of Iran appeared in The Oil and Gas Journal, issue of June 29.

THE story of petroleum in the Middle East has its roots in remotest antiquity. All of us are familiar with the story of Noah's ark in the Bible, and how Noah was directed to "pitch it within and without with pitch"—a standard practice with certain types of native craft to this day. Archeology indicates the use of pitch even before Noah's Flood, when ancient Sumerians found in the asphalt of Hitt and Abu Zhir, near the Euphrates River, a handy material for waterproofing their buildings. The burning seepages at Baku and the "Eternal Fires" of Kirkuk have been objects of veneration since prehistoric times. At Kirkuk also is perhaps the world's oldest oil refinery, a crude affair making a couple of simple cuts, and still operating. The Maidan-e-Naft—Plain of Oil—with the White Oil Springs of southwestern Iran has been famous from earliest times. However, apart from the use of bitumen in construction work and for caulking boats, the principal demand was for oil in lamps. The annals of the expedition of Alexander the Great describe its use in pyrotechnic displays during a royal reception in Ecbatana (Hamadan). Petroleum was also used in the incendiary bombs of the ancients. But such uses, combined, required only small quantities and, apart from excavation of the asphalt "lakes," there is little record of development to augment the supply from natural seepages.

The growth of the modern petroleum industry in America and in Europe during the latter half of the nineteenth century made the world oil conscious. It was not until the turn of the century, however, that substantial interests turned their eyes toward the Middle East. In 1901, William Knox D'Arcy, an Australian businessman, obtained the first oil concession in Iran. Before discussing this grant, and other concessions which followed, it is necessary to consider briefly the history of political developments in that part of the world. Prior to World War 1, the Middle East, except for Iran and certain areas on the Arabian Peninsula, was under the rule of the Ottoman Empire. The Turkish domination was tenuous, especially in the more remote parts, but was, nevertheless, recognized internationally. Iran was an absolute monarchy until, in 1907, the reigning king was deposed, a constitution was adopted and the power of the crown was limited. In theory, at least, Iran became a constitutional monarchy. One must not envisage the democracy of an England. With the bulk of the population illiterate and lacking community of language and with communications varying from extremely poor to nonexistent, little popular interest was taken in politics. In fact, to the peasant, virtually bound to the soil, it mattered not at all whether the Constitution and the Parliament existed. His lot remained the same. From an international point of view, the very independence of the country was, at times, little more than nominal. The political rivalry, or, to use a more descriptive term, the mutual distrust, existing between Russia and Britain in connection with their respective Asiatic ambitions was reflected in Iran. There, two spheres of influence were established—the Russians in the five northern provinces which border on their country, and the British in the south. The pressure exerted in these respective areas was at times so strong that one observer expressed wonder as to where the Iranian sphere of influence might be.

Changes Following World War 1

This picture was greatly modified at the end of World War 1. The Ottoman Empire was reduced to the limits of Turkey proper, in which it shortly succumbed under the drive of the democratic movement of Mustapha Kemal Pasha (Attaturk). Syria and Lebanon were placed under French mandate, while Britain was given mandates covering the area to the south — Iraq, Transjordan and Palestine. In other words, regimes were being set up which were to become more amenable to granting concessions on equitable terms than were the old Ottoman Sultans. Ibn Saud succeeded independently in establishing a truly Arab kingdom covering most of the Arabian Peninsula, although Britain maintained protec-

For the purpose of the present article, the term, "Middle East," is restricted to that part of southwestern Asia from the Mediterranean and Red seas on the west to the Afghan and Indian frontiers on the east. It thus includes the kingdoms of Iran, Saudi Arabia, Iraq and Transjordan, the mandated territories of Syria, Lebanon and Palestine, together with a host of small kingdoms and sheikhdoms around the coast of the Arabian Peninsula

torates along much of the coast line. In Iran, Russia withdraw its physical force and, ostensibly, its political influence from the northern provinces. Concurrently, Britain followed a less aggressive policy than formerly in the south, and Iran enjoyed a greater semblance of real independence than it had for many a year. With the rise to power of Reza Shah in 1925, this independence became an established reality and has remained so, even in spite of Allied military occupation during World War 2.

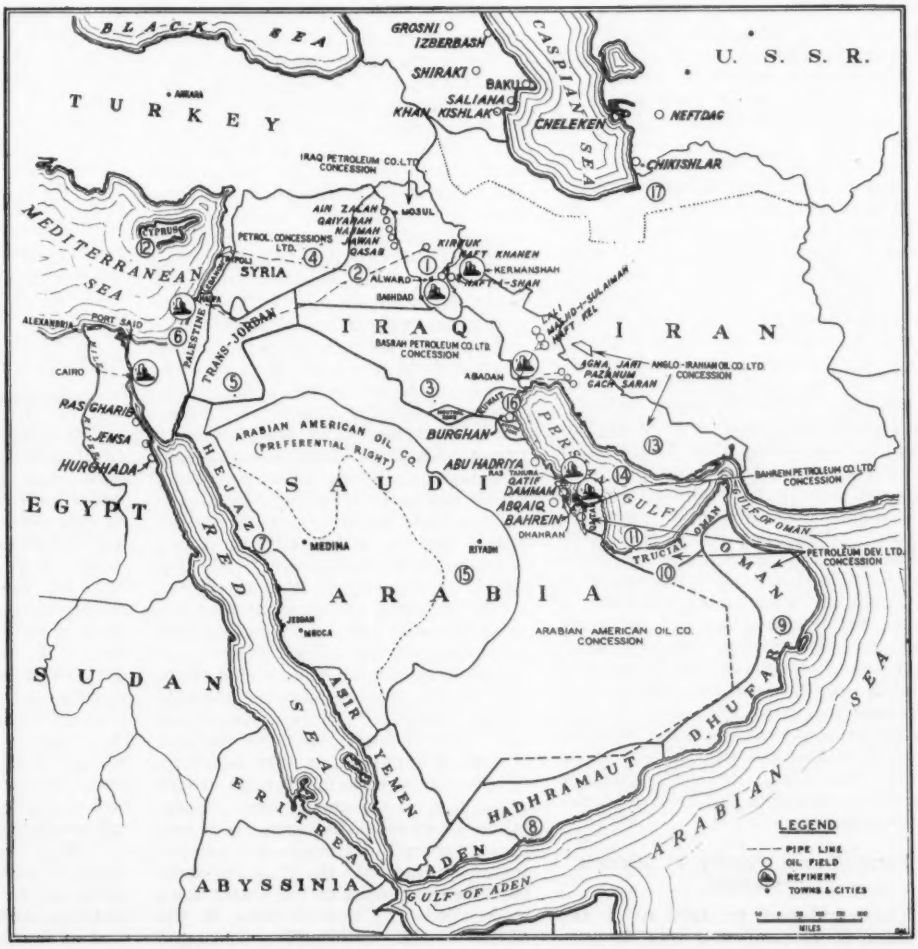
Oil Concessions in Iran

Since the adoption of the Constitution in 1907, down to the present year, the method of obtaining an oil concession in Iran has followed a consistent procedure. One has had to consider two separate bodies — the Government, consisting of the Prime Minister and his Cabinet, and the Majlis or Parliament. A company seeking a concession would submit to the Government, either through the Minister of Foreign Affairs or to the Prime Minister directly, a proposal embodying the conditions under which it was prepared to work. After a period of bargaining and counterproposals, a set of terms acceptable to both parties would be decided on. These would be incorporated in a contract to be signed by the Government and the company. The Government would then submit the contract to the Majlis with suitable recommendations. If that body approved it, after due deliberation and discussion, it would be passed in the form of a special law.

The D'Arcy concession (1901) was obtained under the old absolute monarchy when direct negotiations with the crown were authoritative and final. It was truly a concession on the part of the Iranian Government. The area, a total of nearly 500,000 sq. mi., included all of Iran except the five northern provinces. The concession granted not only the exclusive rights to explore for and to exploit petroleum within the area, but forbade the construction of pipe lines across the area by third parties without the special permission of the concessionary. In return for these privileges, the concessionary was required to make a down payment of £20,000 and a like amount in shares, fully paid and nonassessable and to pay a royalty of 16 per cent of the net profits. A company was organized, largely with British capital. It continued to grow, although there were periods of doubt, as when the assistance of Burma Oil was sought. In 1914, the British Admiralty became interested for strategic reasons and bought into the company, supplying some much-needed capital. Thus was born the Anglo-Persian (now Anglo-Iranian) Oil Co., Ltd., in which the present holdings of the British Government amount to 56 per cent of the total shares.

Area Reduced Under New Contract

Shortly after Reza Shah ascended the throne of Iran, question was raised as to nonperformance on the part of the company in regard to certain terms of the contract. The concession was revoked and, ultimately, a new contract was drafted, this time on far more favorable conditions to the Iranian Government. In its final form, the time was extended to 60 years dating from December 31, 1933. The area was reduced, first to about 200,000 sq. mi., and a 10-year period



This map shows the principal oil operations in the Middle East. The numbers refer to the following concessions: (1) Iraq Petroleum Co., Ltd.—Iraq; (2) British Oil Development—Iraq; (3) Basrah Petroleum Co., Ltd. —Iraq; (4) Petroleum Development (Syria), Ltd.; (5) Petroleum Development (Transjordan) Ltd.; (6) Petroleum Development (Palestine) Ltd.; (7) Petroleum Development (Jidda), Ltd.; (8) Petroleum Development (Hadhramaut) Ltd.; (9) Petroleum Development (Oman & Dhofar) Ltd.; (10) Petroleum Development (Trucial Coast) Ltd.; (11) Petroleum Development (Qatar) Ltd.; (12) Petroleum Development (Cyprus) Ltd.; (13) Anglo-Iranian Oil Co., Ltd.—Iran; (14) Bahrein Petroleum Co., Ltd.; (15) Arabian-American Oil Co.; (16) Kuwait Oil Co., Ltd.; and (17) Russo-Iranian Concession—Iran. The first 12 comprise the Iraq Petroleum Co. group

granted in which to make final choice of an area not to exceed 100,000 sq. mi. The royalty was changed from a percentage of the net profits to a flat rate of 4 shillings gold per metric ton (22 cents per barrel). A minimum royalty clause was inserted to guarantee revenue to the Government during periods of curtailed production. Local markets were assured priority and a fixed retail rate was established for all Iran. Certain educational obligations were also imposed upon the company. Iran was becoming modernized. The history of this concession is, in fact, illustrative of the trend in the attitude toward oil concessions on the part of all governments in the Middle East, and there is very little difference between the revised contract with the Anglo-Iranian Oil Co. and the later concessions granted by neighboring countries. The record of the Anglo-Iranian is one of enviable success. Yet, considering their start, it is doubtful if they could have achieved the same result if such onerous terms had been imposed at the outset of their venture. Indeed, it is questionable if anything less than a powerful coalition of large companies can afford to consider an oil concession under conditions such as are now in vogue in the Middle East.

Anglo-Iranian began developments in the field at Naft Khaneh between Bagdad and Kermanshah, on the Turkish, now Iraqi border. The site was unfortunate. Not only is it some 300 miles from a deep water shipping point, but it involved serious complications with the Turkish Government. Shortly after, the scene of activity was shifted to the Bakhtiari hills in southwestern Iran. Here, in 1908, the Masjid-i-Suleiman anticline was discovered, and large scale production reasonably close to tidewater was assured. Commercial exploitation can be said to have started in 1913 when 1,800,000 bbl. were produced. Further developments were accomplished in the years following World War 1. Haft-Kel was discoverd in 1925, to be followed shortly after by Gach-Saran and Agha-Jari, although commercial developments on these last two fields have not been completed until recently. White Oil Springs was also the scene of separate development southeast of Haft-Kel. This and the gas field of Pazanum which adjoins the Agha-Jari structure complete the picture of discoveries to date.

Forty Years' Supply at Present Output

The combined production of the Iranian fields reached a total of 210,000 bbl. a day during the period 1937-39. By 1944, owing to war demands, this was more than doubled. The cumulative production to date has been about 1,500,000,000 bbl. Proved reserves are estimated at something between 4,000,000,000 and 6,000,000,000 bbl. or about 40 years' supply at present rates of production. The chances for additional discoveries are considered good. A large refinery dealing chiefly with the production of liquid fuels was built at Abadan on the Shatt-al-Arab where ocean-going tankers can be supplied. The present throughput capacity of this refinery, which was augmented during the war, is now 550,000 bbl. per day. It is supplied from the four major oil fields through a multiple system of pipe lines. A small refinery of 20,000 bbl. a day capacity was erected at Kermanshah to supply the internal markets of northern and western Iran. One hundred and twenty miles of 3-in. pipe line connect it with the oil field of Naft Khaneh. A later refinery, the Alwand, with a throughput of 30,000 bbl. a day, was built near Naft Khaneh field to supply the Iraqi trade.

Northern Iranian Concessions

The history of oil concessions in northern Iran does not offer the continuous story that we have followed in the south. With the British firmly entrenched in an area which extended beyond the theoretical limits of their sphere of influence, it was only natural that the Russians seek equivalent rights in the north. Any oil which might be found in the Caspian area would be a welcome supplement to Russian production that centered around Baku. Indeed, the only logical outlet for such oil would be to the north in view of the great distances and difficult terrain between the northern provinces and tidewater, to say nothing of the exclusive features of the D'Arcy concession. However, times were troublesome throughout Asia and especially in northern Iran. The Russo-Japanese War had an effect on Russian activities if not on policy. The cessation of those hostilities was followed shortly (1905) by the outbreak of a strong revolutionary movement in Iran which culminated in the overthrow of the despotic government and the establishment of a constitutional monarchy in 1907. Like some more recent disturbances, the chief activity was in the north. Russia's attitude toward the "democratic" movement was never friendly and, by 1911, it amounted virtually to open hostility. On various occasions, Russian troops were sent in on one pretext or another. Skirmishes between them and the Iranians occurred at several points, ending with the Russians bombarding the Shrine of the Imam Reza in Meshed—the holiest place in the Shiah world. Ultimately, estranged relations were patched up and at least a semblance of peace and quiet restored, not, however, without Iran acceding to Russia's demands. With this background in mind, delays in such matters as commercial oil concessions can be understood. In 1913, a concession was granted to a Mr. Khoshtaria, a Russian subject from Georgia, covering the oil rights in the five northern provinces under conditions similar to those granted D'Arcy in the south.

World War 1 and the Russian Revolution which followed prevented the development of this concession. The state of unrest in Iran as an aftermath of the war was prolonged throughout most of 1921 by a revolt of the Kurds in Azerbaijan. The whispering campaign at the time hinted at British meddling. Naturally there was no proof to substantiate such rumors. Khoshtaria pleaded "force majeure." On the Iranian side, strong sentiment was expressed by some elements advocating abrogation of the contract. The Iranian Government, however, was reluctant to act pending the expression of some definite opinion on the part of Soviet Russia. In the meantime, a British company, the North Persian Oilfields, Ltd., was organized for the purpose of acquiring the northern oil rights by direct negotiations with Khoshtaria. Following the failure to ratify the proposed Anglo-Persian Agreement, early in 1921, and acting presumably on some understanding with Soviet Russia, the Iranian Government formally announced that the Khoshtaria concession was null and void. The grounds were that the concession had been obtained under duress and that it had never been approved by the Maplis (Parliament) as required under the constitution. Thus ended the first attempt on the part of Russian interests to acquire oil rights in Iran.

Beginning of American Interest

The year 1921 also marks the beginning of American interest in this area. The Russians had definitely withdrawn from the field, and the British had put forth only a half-hearted claim to any rights based on earlier negotiations with Khoshtaria. This left northern Iran open to new negotiations. The Iranian Government expressed eagerness to do business with Americans. As they put it, they stood in no danger from imperialistic policy on the part of the United States. The Americans, for their part, were goaded on by premature estimates of rapidly dwindling reserves at home. Before the end of the year, bids were submitted independently by the Standard Oil Co. (N. J.) and by Sinclair. An attempt was made to duplicate the terms of the D'Arcy concession. The Iranians, however, demanded 16 per cent of the gross production based on

Mexican or Rumanian prices, whichever happened to be higher. This might be considered as the first step in the evolution of Middle Eastern oil concession contracts toward their present form. As yet, no mention was made of down payments, minimum royalties, preferential markets and the host of subordinate conditions which crowd the more recent contracts. The concession was, however, contingent on a loan of $10,000,000. This was rendered difficult by the failure of the Iranian Government to offer any collateral acceptable to American bankers. The customs receipts had already been mortaged to the hilt and, at that time, all other sources of governmental revenue were too nebulous to be attractive. After a couple of years of negotiations, the project was dropped.

The question of oil concessions in northern Iran lay dormant until 1936 when Americans again entered the picture. In that year, the Amiranian Oil Co., a new organization in which several prominent names participated, acquired a concession covering northern Iran from the Caspian Sea to the eastern frontier and extending southward to within 100 miles of the coast, where it met the then boundary of the Anglo-Iranian concession. Considerable geological work was carried on, but the concession was abandoned in 1938. This concession is of interest in the present discussion solely because it illustrates another step in advance in the evolution of the Middle Eastern oil concession contract. No heavy down payments were expected, but otherwise the terms were the most onerous demanded by Iran to that time.

New Interest in Northern Iran

In 1944, interest in north Iranian oil was reawakened. At the close of 1943, in compliance with the terms of the revised contract, the Anglo-Iranian Oil Co. relinquished its rights in southern Iran east of the Straits of Hormuz. Early in 1944, the Standard-Vacuum Oil Co. opened negotiations for a concession in southeastern Iran. At the same time, the Shell interests entered the field. They were followed shortly after by Sinclair. The Iranian Government was not slow to take advantage of this competitive situation. As it turned out, negotiations did not get to the point of stipulating minimum terms, but strong hints were thrown out as to down payments of as much as $4,000,000, fixed royalties of 23 cents per barrel, minimum royalties of $1,000,000 a year and only 1 year in which to begin drilling. A host of minor conditions were also mentioned, none severe by itself, but, in the aggregate, imposing serious obligations on the concessionary. At this juncture, a few deputies to the Majlis voiced the opinion that any prospective oil fields should be exploited by Iranians and not be given away to foreigners. Impracticable as such a plan may sound, it was, nevertheless, a straw in the wind indicating a trend toward a stronger nationalistic policy.

While negotiations for southeastern Iran were still in the formative stage, the Russians came forward demanding their rights in the five northern provinces. They expressed the attitude that they did not care who got the southeastern concession as long as they held the northern one. It was also apparent that they would not consider any such terms as were being talked of for the south, nor would they take "no" for an answer. This put the Iranian Government "on the spot." Whatever they did was bound to lead to international unpleasantness which they could ill afford. The Iranians extricated themselves from the dilemma by two adroit moves. In the first place, they refused to discuss further the matter of oil concessions until after the end the war and until all foreign troops had left their soil. Second, they took away the right to negotiate oil concessions from the Government—specifically the Ministry of Foreign Affairs and the Ministry of Finance—and vested that right in the Majlis. This was tantamount to saying that oil concessions will not be discussed. In a country where there is no established mineral code, each concession is the subject of negotiations. One cannot dicker with a parliamentary body, least of all, in Iran.

A Russian-Instigated Revolt?

Finally V-J Day came, and a few months later, all British and American forces left Iran. This heralded a revolt in Azerbaijan. Comparing it with the events of 1920-21, this time gossip had the Russians as instigators. No one will ever know whether there is any truth in this assertion. History, and it goes back mere than 4,000 years, would indicate that the Kurds do not require much outside prodding for their revolts. The fact remains, however, that Russian forces, although presumably few in number, did stay in Iran after the time when they had promised to leave. Protests reached the United Nations only to be followed by conflicting official statements from Tehran. While discussion was in progress, the Soviet press mentioned that Iran had twice violated a treaty which had been signed with Russia in 1921 wherein Russia had agreed to give up all oil rights in northern Iran provided Iran would not cede those rights to the nationals of a third power. Whether such a treaty exisetd is not known to the writer. It is, however, most unlikely that Iran would have dared enter into public negotiations with American interests on two separate occasions in open violation of such a treaty. It is also an established fact that Russia voiced no official public

objection either to the American negotiations of 1921-23 or to the Amiranian concession of 1936-38. We have been told of a Russo-Iranian agreement adopted during World War 2 whereby Iran was to cede to the Soviet Union the original Khoshtaria concession upon the withdrawal of Russian forces from Iran. This sounds more reasonable.

Russian-Iranian Partnership

The Russian forces finally withdrew, and an oil concession was granted in the north. The area, approximately 100,000 sq. mi., is somewhat smaller than the original Khoshtaria grant. Steering wide of the Turko-Iranian frontier, it takes in less than half of Azerbaijan and but a fraction of Khorasan, both of which provinces were entirely covered in the original grant. But the terms are most interesting and write what may be the final chapter in the evolution of the Iranian concession contract. In fact, the arrangement is a partnership and not a concession at all. A Russo-Iranian oil company will be formed in which Russia holds 51 per cent and Iran 49 per cent. Russia will supply materials, working capital and technical skill. Iran puts up the land and what it may contain. At the end of 25 years, the participation will be 50-50. At the end of 50 years, Iran has the privilege of buying out the Russian share or of continuing with the company on the 50-50 basis.

Thus a new note has been struck in the old game of oil concessions. It is one which may have far-reaching repercussions, not only in Iran, but in many other countries as well. As the matter is now understood, without heavy down payments and without minimum royalties, such an arrangement might work to the financial advantage of a company seeking a concession, certainly until it had reached the stage of sustained large-scale production. At the same time, it presents certain obvious disadvantages, not to say dangers. In countries such as one finds in the Middle East without well-defined mineral codes or corporation law, special legislation would be necessary to safeguard the company's interests or even its very existence. Such legislation would be subject to the same sort of negotiations as are necessary to establish a concession under the existing system. It is conceivable that, in passing such legislation, the granting government might impose obligations as severe as any under the existing system. In other words, revolutionary as it may sound, this new departure in Iran brings us back to where we started.

WASHINGTON WATCHING

BY HENRY D. RALPH

A New Marketing Inquiry?

WASHINGTON. — Petroleum marketing probably will come under the scrutiny of the House small-business committee which has announced that it will make an investigation into the growth of monopoly and the concentration of economic power in the distribution field.

Hearings will be held this fall and winter, with most of the evidence being supplied by the Department of Commerce. Rep. Estes Kefauver of Tennessee heads the subcommittee which will conduct the inquiry.

The investigation will be a more or less objective study along the lines of the prewar Temporary National Economic Committee which did not delve deeply into distribution and marketing. The committee has no powers beyond investigation and recommendation, but its findings may well become the basis for new legislation. Chairman of the full committee is Rep. Wright Patman of Texas who has sponsored many bills to regulate business, particularly in the distribution field.

The Commerce Department has not disclosed what industries will receive its chief attention, but the inquiry will be directed particularly into control of retail outlets by producers, the competitive position of chains and independent dealers, and the growing practice of merchandisers of taking on lines of goods foreign to their original function.

Final O'Mahoney Report

THE final report of the special Senate committee on petroleum resources may not be published until the opening of the new Congress in January. The committee's life extends that long, and just before adjournment the Senate gave the committee permission to file its report with the secretary of the Senate at any time after adjournment.

Chairman O'Mahoney and the committee counsel, Henry S. Fraser, have done some work on the report but will not complete it until the last two volumes of hearings have been indexed and published. These will deal with the position of the independent company in the petroleum industry, and the postwar plans of the new Oil and Gas Division of the Interior Department.

The committee reports a brisk demand for copies of its six published volumes of hearings, which contain much valuable source material and statistics. The committee's supply of copies for free distribution was long since exhausted, and copies are being sold by the Government Printing Office at prices ranging from 75 cents to $1.25 per volume.

The published volumes of hearings cover: Cartels in Relation to Petroleum in World Trade; New Sources of Petroleum in the United States; American Petroleum Interests in Foreign Countries; Petroleum Requirements Postwar; War Emergency Pipe-Line Systems and Other Petroleum Facilities; and Wartime Petroleum Policy Under the Petroleum Administration for War.

Elk Hills Contract Changes

THE House naval affairs committee has scheduled a hearing for September 9 to consider a change in the contract between the Navy Department and Standard Oil Co. of California for operation of the Elk Hills Naval Petroleum Reserve.

The contract now calls for Standard to pay the cost of maintaining the field in readiness for emergency full production so long as it is taking out any oil, whereas the Navy would pay this cost if no oil were produced. This was satisfactory so long as Standard was producing 15,000 bbl. per day, but production has now been cut back to 8,450 bbl. per day which is the figure set by engineers as the minimum which must be produced to keep the field in good condition.

This situation was not foreseen when the contract was drawn, and California Standard is asking that the Navy pay its share of the readiness cost of maintaining shutdown wells while the company will pay the cost of producing the oil necessary to keep the reserve in standby condition. The Navy is not expected to oppose the amendment but the law requires prior approval of the naval affairs committee.

Big Inch Oil's Proposition

REPRESENTATIVES of Big Inch Oil, Inc., are confident that their bid for purchase of the two Texas-New York War Emergency Pipe Lines will be accepted by War Assets Administration when WAA completes its task of analyzing and comparing the 16 proposals for disposition of the lines.

They claim their offer is the only one which completely meets all the requirements laid down by WAA—fair price to the Government ($110,000,000), use for oil rather than gas, maintenance of all oil facilities subject to reuse by the Government in case of national emergency, operation as a true common carrier serving both large and small companies, adequate financial resources, and freedom from control by major oil companies or "monopoly interests."

It seems clear that WAA will adhere to its earlier policy of not approving sale of the lines for use of natural gas unless it is impossible to obtain an acceptable bid for oil use, and then only after specific approval by Congress.

Several other bids propose to use the lines for oil but most of them were rather vague about their financial backing and market prospects, though all bidders have the opportunity of submitting supplemental data on these points. It probably will be 2 or 3 weeks before the WAA staff completes its study of the bids and submits a report to the Administration for action.

The extent of interest in using the big-inch lines for oil appears to indicate a changing view of the economics of petroleum distribution. Several people are willing to risk many million of dollars that the WEP lines can be profitably used for oil transportation. One factor undoubtedly is the higher cost of tanker transportation as a result of recent increases in maritime wages.

It is significant that last April Big Inch Oil, Inc., offered to buy the 20-in. products line only for $40,000,000 in connection with a proposal by a companion corporation, Big Inch Gas, Inc., to pay a similar price for the 24-in. line if the Federal Power Commission would permit its conversion to natural gas. Now this company thinks it can pay $110,000,000 for the two lines and use them both for crude petroleum and petroleum products.

This bidder reserved the right to build a 30-in. natural-gas transmission line on the right-of-way, a condition which probably would not be an obstacle to WAA acceptance so long as there is assurance that the original lines will be maintained in oil service. Other reservations of Big Inch Oil, Inc., might possibly be deterrents, however. These include the right to reverse the flow of parts of either line, the right to rearrange and relocate feeder and distribution lines, and the right to tear up the eastern

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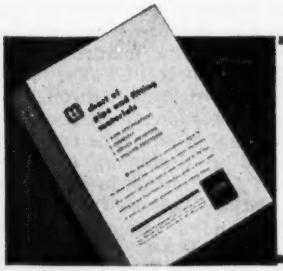

TUBE TURNS (INC.), LOUISVILLE 1, KENTUCKY

Please send new Tube Turns chart of pipe and fitting materials, showing grade and standard type numbers, ASTM specifications, and chemistry and service limitations, plus description of welding procedures, including rod, preheat and stress relieving.

NAME..... COMPANY.....

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ZONE..... CITY..... STATE.....

2308

end of the 20-in. to get pipe for its proposed extension from Longview to West Texas if other pipe should not be available.

Backers of Big Inch Oil, Inc., include Charles H. Smith of New York, C. T. Chenery, chairman of the board of Southern Natural Gas Co., and Oscar Cox, Washington attorney formerly chief counsel of the Foreign Economic Administration. The backers claim they have no connections with any major oil companies beyond a belief that a number of them will ship via their lines, and that they have contractural arrangements for raising $96,000,000. The offer to WAA is $66,000,000 cash and $44,000,000 in 30-year, 4 per cent, income debentures.

Few Draft Deferments

NEW occupational deferment regulations which go into effect when the draft resumes in September have just been announced. They fulfill the predictions that they will effect relatively few men in the petroleum industry.

The Civilian Production Administration will certify the deferment need of certain individuals when employers make application of Form 42-A, but only two categories of men will be considered. The first is qualified and irreplaceable production workers in industries on the critical list, which includes in the petroleum group only butyl rubber and tetraethyl lead. The second is supervisory, technical, or scientific personnel in essential industries which, while not critical, are still basically important to the national reconversion and production programs.

Selective Service System has warned that CPA's certifications will be honored only if the total number is kept small.

National Interest Requires Ample Domestic Oil Supply

The following comments refer to the address made earlier this month by J. A. Krug, secretary of the interior, before the Interstate Oil Compact Commission in Grand Rapids, Mich., in which he predicted the necessity for substantial oil imports. The reaction of seven other industry leaders to Krug's remarks was published in The Oil and Gas Journal, pages 62 and 63, issue of August 24.

Sirs:

I cannot agree with Mr. Krug's thinking in regard to increasing imports, as expressed in remarks made by him at the Grand Rapids meeting of Interstate Oil Compact Commission. The same thoughts were held by some representatives of both Government and industry following World War 1 and particularly about 1929. However, the course thereafter taken by the industry and government was the direct opposite of such thinking, and we now know that had such an opposite course not been followed we would not have been able to supply the enormous volume of petroleum products which we did furnish in World War 2, not only to the armed forces of this nation but also to its Allies.

Any increase in imports will be offset by a decrease in domestic exploration, development, and production. A healthy domestic industry cannot exist in such an environment. Furthermore, if an emergency arises we would then be dependent upon foreign petroleum which either might not be available to us or which circumstances then prevailing might prevent our using. Our national oil policy should be such as will result in the development and maintenance at all times of an ample producible supply of petroleum within our own borders. C. A. JOHNSON,
President, Holly Development Co., vice president for Southern California, Independent Petroleum Association of America.

Celanese Corp.'s Research Center Near Completion

CORPUS CHRISTI. — Construction of a $3,000,000 research center by the Celanese Corp. of America is well under way here and initial operations probably will begin within the next month, officials of the company announced last week.

J. E. BLUDWORTH

An outgrowth of the Celanese Chemical plant at Bishop, Tex., where chemicals are produced from natural gas, the center's prime research purpose will be for investigation and research connected with chemicals that can be derived from petroleum derivatives. It also will conduct research to utilize present products in other processes to make new or improved materials.

Located on a 50-acre tract 6 miles west of Corpus Christi, the research laboratory will have its own maintenance, construction, and fine instrument departments. Its facilities will include distillation apparatus, spectrometric analysis and electronic devices. There will be more than 5,000 sq. ft. of laboratory space.

Joseph E. Bludworth, Corpus Christi, is director of petroleum chemicals research and development division of the Celanese Corp. of America.

Fuel Oil Consumption by Electric Utilities Drops

WASHINGTON. — June consumption of fuel oil by the nation's electric utility plants fell 18.8 per cent from the record high figure reached in May as a result of the coal strike.

The Federal Power Commission reported June consumption was 2,849,636 bbl. compared to 3,510,746 in May. Gas consumption in June by electric utilities rose 7.5 per cent over the previous month from 26,753,123,000 cu. ft. to 28,757,396,000 cu. ft.

Survey Shows California Wages Up 34.51 Per Cent

LOS ANGELES. — Current wages in the production division of the California oil industry average $1.38 per hour, a 34.51 per cent increase over the average on January 1, 1941, according to figures from an Oil Producers Agency survey of wages and hours.

The agency's survey shows that, since January 1, 1941, major companies have put an average increase of 38.15 per cent into effect, the principal minors (producers of 45,000 bbl. or more per month), an average increase of 33.65 per cent, and independents an average increase of 33.67 per cent. The averages do not reflect overtime earnings.

Cities Service Conducting Water-Flooding in Kansas

Cities Service Oil Co. last week disclosed two water-flooding projects under way in Greenway County, eastern Kansas.

The work includes initial water-flooding of Cities Service's Patterson property, involving some 200 productive acres, and completion of the program now in progress on the joint interest, Seeley-Clopton unit, which has a total of 390 productive acres. The company estimated that these two projects will result in an ultimate increase in gross production of about 1,150,000 bbl.

South Penn Oil Co. Buys Pennsylvania Properties

BRADFORD, Pa.—South Penn Oil Co. has purchased three oil and gas-producing properties in Lafayette Township, McKean County, including 83 wells and 50 water-intake wells on 145 acres, from Burns Oil Co., according to George J. Hanks, South Penn president.

The leases adjoin lands operated by South Penn and it was said the company intends drilling on the undeveloped portion of the newly acquired leases.

Oil History Film Distributed

A sound slide film on the history of the oil industry, produced by the Coca-Cola Co. and previewed by the American Petroleum Institute board of directors at its recent Dallas meeting, is now distributed throughout the country for showing before civic and educational groups. The company was assisted in producing the film by the A.P.I., Mid-Continent Oil & Gas Association, Western Oil and Gas Association, and a committee of oil industry leaders.

Minor Price Adjustments, Heavy Consumption, Noted During Week

MINOR price adjustments in New York and California and continued heavy consumption of motor fuel with the approach of Labor Day marked trends in petroleum markets during the week.

Gasoline demand, at near-record levels throughout the summer, appeared to be reaching a climax. Labor Day is usually regarded as the seasonal turning point, but many suppliers believed consumption will remain unexpectedly high well into October, particularly with mild weather.

In the Mid-Continent area, no significant price changes were reported. Gasoline was moving to the jobber trade at 6¾ cents. There was no spottiness in the motor fuel market, but it was felt that demand will begin easing soon. The burning oil market was reported still weak.

In New York, Socony-Vacuum Oil Co., Inc., citing changes in local marketing conditions and operating costs, raised the tank-wagon price of its gasoline and fuel oil 0.1 cent to 10.4 cents and 8.8 cents, respectively. Adjustments were made at other eastern points. Five majors immediately followed Socony-Vacuum's revision, while four others continued as before.

Diesel quotations were uniform at all terminals in New York and New England except New York harbor. New diesel prices were 2 cents above No. 2 postings at all points in the area of New York harbor. There, diesel tank-car prices were 6.5 cents and 6.55 cents per gallon. New York harbor tank-car prices for branded motor fuel ranged from 8 to 9 cents with a single supplier quoting the low.

On the Pacific Coast, fuel-oil prices leveled off this week following more than a week of uncertainty over which of two revised postings would prevail. After General Petroleum Corp. cut diesel fuel oil 40½ cents per barrel and increased heavier fuels 10 to 15 cents per barrel at most Pacific Coast delivery points to all classes of trade, Standard Oil Co. of California revised its fuel postings, but varied considerably from General Petroleum's postings.

Tide Water Oil Co. and Union Oil Co. which earlier advanced heavy fuel-oil prices paralleling General's prices changed 3 days later meeting the Standard of California schedule.

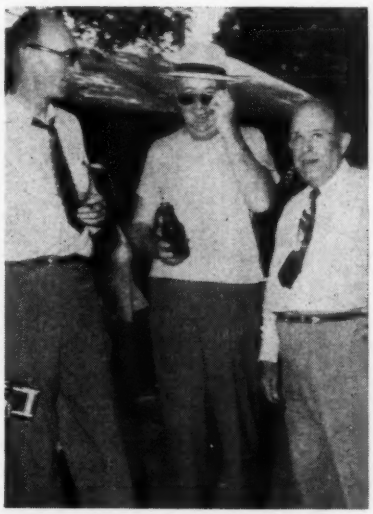
Pipe Liners Reunion Attended by 1,000

D Bar Ranch, located about 50 miles north of Fort Worth, played host to approximately 1,000 persons during the Pipe Liners Reunion early in August.

C. Hobson Dunn, owner of the ranch and president of the Eastern Construction Co., Inc., Dallas, provided the entertainment.

Honor guest of the occasion was Allen Dunn, celebrating his eighty-ninth birthday. Dunn is an old timer in the transportation business, who started out in the early days operating an ox-wagon train when there were only 5 miles of railroad in the entire state of Texas. He is the father of Hobson Dunn.

Nearly every major oil and pipeline company was represented. Among those present were: B. E. Hull, president of The Texas Pipe Line Co.; A. N. Horne, Texas Empire Pipe Line Co.; A. C. Wilkinson, general superintendent, pipe-line division, Continental Oil Co.; J. L. Latimer, president of Magnolia Petroleum Co. and Magnolia Pipe Line Co.; Harry K. Phipps, Socony Vacuum Oil Co., Inc.; R. R. Irwin, president and general manager of the Socony-Vacuum's White Eagle Division; L. R. Dickinson, chief engineer, Socony-Vacuum; R. C. Sanders, Gulf Refining Co.; Gardiner Symonds, president, Tennessee Gas & Transmission Co.; H. H. Johnston, Houston, auditor; J. P. Bristow, vice president, Tennessee Gas & Transmission; W. B. Poor, chief engineer, Tennessee Gas & Transmission; O. D. Stallard, division superintendent, Central Division, Magnolia Pipe Line; Bruce Cory, Socony-Vacuum Oil Co., Inc.; Steve Bergman, Panhandle Eastern Pipe Line Co.; and Ray H. Siegfried, Tulsa.



Among those at the Pipe Liners' Reunion were A. N. Horne, vice president, Texas Empire Pipe Line Co.; J. L. Latimer, president of Magnolia Petroleum Co. and Magnolia Pipe Line Co.; and B. E. Hull, president of the Texas Pipe Line Co.

DEATHS

George L. Kay, 56, president of Preston Oil Co., Denver, died August 17 in Denver. He formerly was with Midwest Oil Co., Casper, Wyo., and at the time of his death also was vice president of Cow Gulch Oil Co. and the Fremont Petroleum Co.

Paul Shuman, 62, treasurer and a director of Atlantic Refining Co., died August 22 at his home in Malvern, Pa. He had been with the company since 1920.

Edward T. Jackson, 74, retired head of the claim department of The Texas Co., died August 21 in Houston.

Halbert E. Boner, 62, vice president and a director of MacMillan Petroleum Corp., died in Los Angeles August 24. He was stricken by coronary thrombosis a week ago while vacationing. He had been in charge of MacMillan manufacturing operations for 20 years and was a nationally-known refinery engineer. At one time he was assistant manager of manufacturing for Union Oil Co. and operated for a time as an independent refiner in Texas.

Charles L. Logsdon, 59, associated with Cities Service Oil Co. for 19 years, died August 20 at his home in Ponca City, Okla.

John M. Schaeffer, 56, accountant with E. S. Moran, drilling contractor, for the past 25 years, died August 24 at his home in Tulsa.

Carl L. Johnson, 57, chief chemist for Franklin Oil & Gas Co., Bedford, Ohio, died August 17 in Cleveland.

James William Holman, 70, retired independent operator, died August 21 in Tulsa.

Edward D. Avert, 72, independent oil operator since 1910, died August 20 at his home in Tulsa.

P. V. Kors, 64, secretary to the vice president, pipe-line department, Sinclair Refining Co., died August 19 in Rochester, Minn.

Oil Shale—

America's Fuel Ace in the Hole

As Seen by the U. S. Bureau of Mines

THE average American motorist, becoming more and more impatient for delivery of his new 1946-model automobile, hasn't found much time to worry about his future supply of gasoline and oil—not yet.

But long before he is ready to consider trading in his old car on a 1961 or 1966 model, chances are that he will have heard much more about this question—now only a small dark cloud on the horizon. His government already is concerned, for the best available estimates indicate that the crude petroleum reserves of the United States will be largely exhausted in 15 or 20 years. Two decades isn't long when the issue involves the economic life and security of a nation.

Despite greatly expanded exploratory efforts, discoveries of new pools or fields of crude petroleum in the United States have declined below consumption. The war has cut heavily into limited known reserves. The day is approaching when auxiliary domestic sources of oil and gasoline may be needed to fuel America, and it doubtless will arrive before atomic energy is fully harnessed for civilian service. Acting under synthetic-liquid-fuels legislation approved by Congress, the Bureau of Mines of the Department of the Interior is preparing for that day.

One phase of its investigation is centered in three western states—Colorado, Utah, and Wyoming—within whose borders are the nation's principal oil shale reserves.

Known to many travelers and visible to all who pass over several of the major transcontinental rail, highway, and air routes, these "mountains of oil" have never been exploited.

(Continued on page 97)

THIS ARTICLE DISCUSSES:

Oil shale as a possible future source of liquid fuels.

American oil-shale deposits contain estimated 92,000,000,000 bbl. of oil.

Demonstration plant being built on Naval Oil Shale Reserves in Western Colorado.

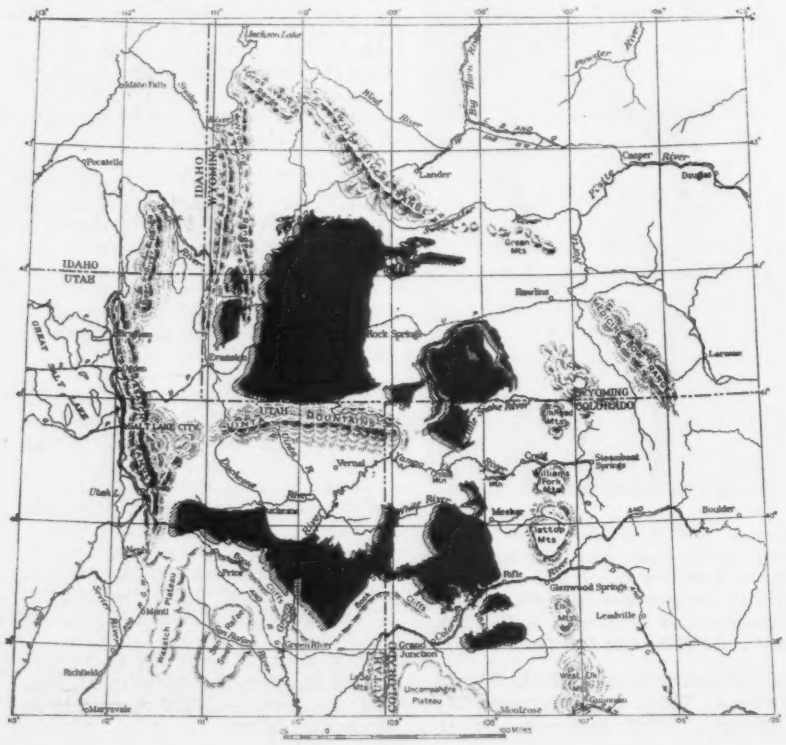
Oil shale research laboratory under construction at Laramie, Wyo.

Technical problems which must be solved before commercial production.

Bureau of Mines program to test German oil-shale processes.

Five-year plan expected to provide "know how" for private industry.

Success of program would contribute to security of United States.



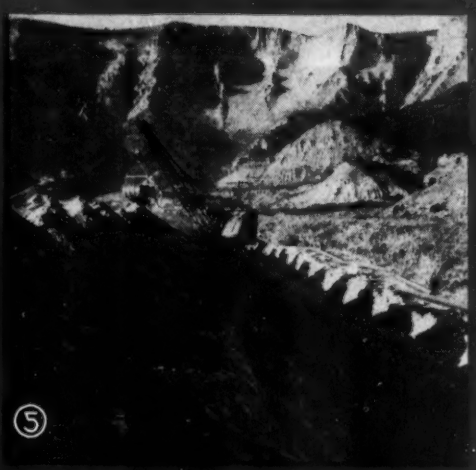
The Green River oil-shale formation of Colorado, Utah, and Wyoming, indicated by the shaded areas on this U. S. Geological Survey map, is estimated to contain 76 billion barrels of oil, or more than 82 per cent of the recoverable shale oil in the United States. The new oil-shale demonstration plant of the Bureau of Mines is just west of Rifle, Colo. (lower right), and the oil-shale research and development laboratory at Laramie, Wyo. (extreme right)

1. A closeup of oil shale near Rifle, Colo. It is estimated the richest 49 ft. of this bed will yield 100,000 bbl. of oil per acre

2. Drilling holes for blasting with sledge and bit, these Bureau of Mines oil-shale samplers are working on the oil-shale cliffs near the bureau's experimental mines near Rifle

3. Drill holes are sunk preparatory to blasting in the lower adit of the oil-shale mine near Rifle. Oil shale is tough, hard to drill, and difficult to break with explosives

4. A haulage worker drops a trip of loaded cars and picks up a string of empties near the portal of the experimental oil-shale mine. The Colorado River may be seen in the distance

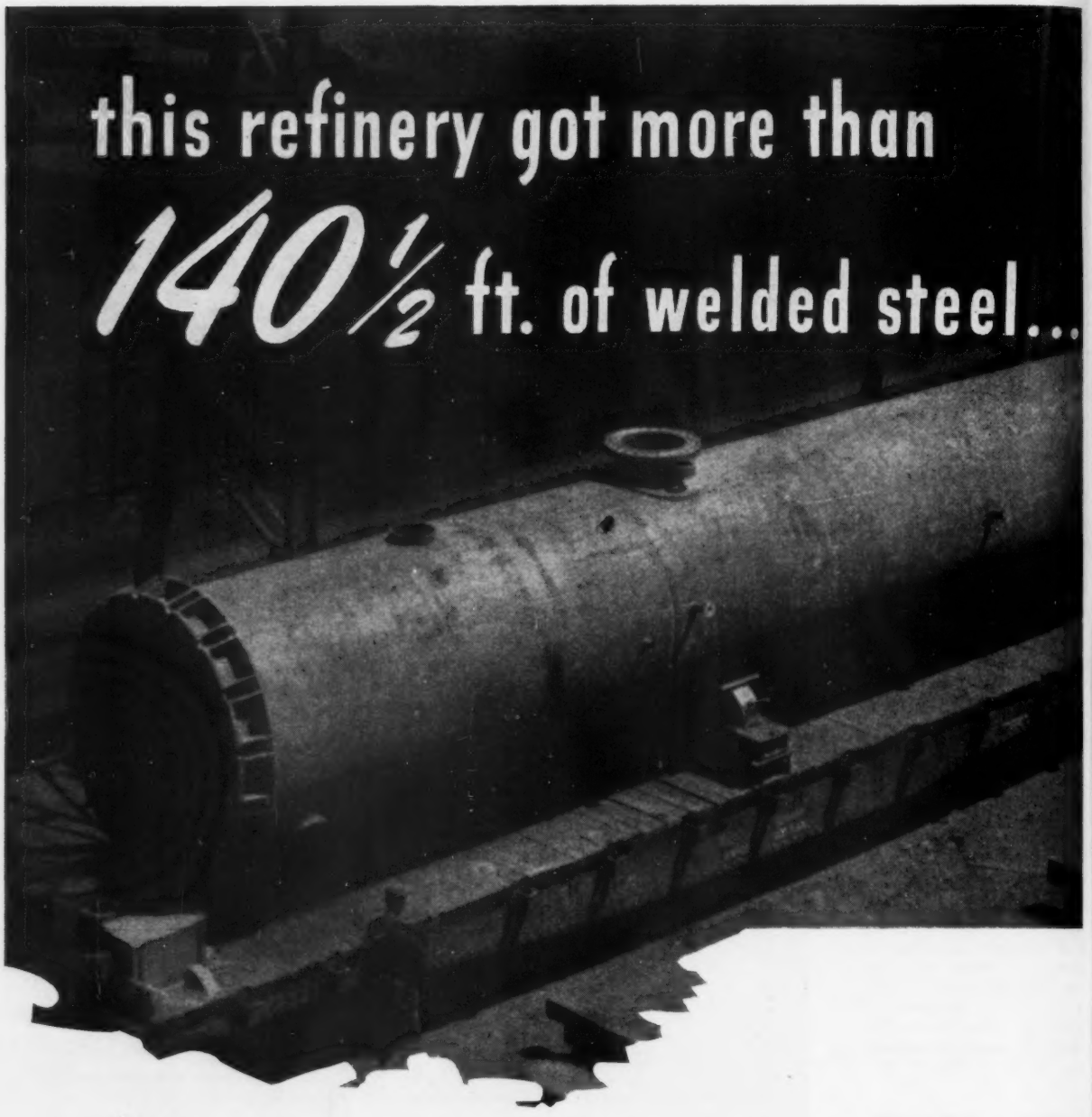


5. A dragline excavates a trench for a water line from the Colorado River to the B. of M. oil-demonstration plant and camp sites. Oil-shale cliffs rise in background

6. Oil-shale demonstration plant area viewed from south showing office building in center, framework of warehouse to left, and power-transmission line to right

7. Air view showing oil-demonstration plant site at right; the camp site in center, and the ridge leading to the mine portals, left

this refinery got more than 140½ ft. of welded steel...



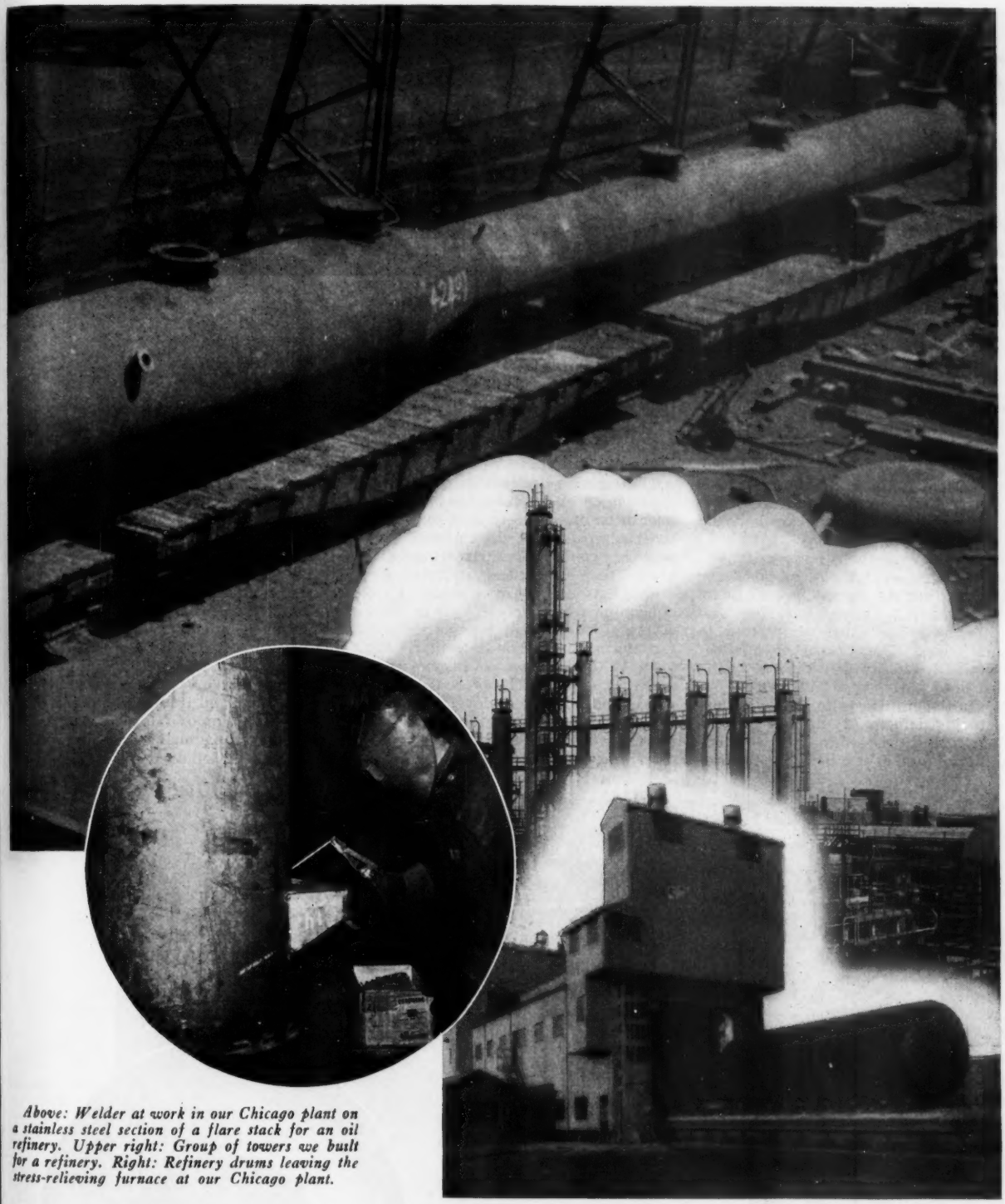
★ To be sure, all that the casual observer sees in this huge absorber-stripper tower is a vessel 140½ ft. long, 7 ft. in diam. at one end and 4 ft. 6 in. diam. at the other. Incorporated in this vessel, however, is the "know-how" the men in our plants have acquired in designing and fabricating thousands of refinery towers for the petroleum industry everywhere. Bound for a refinery in Pennsylvania, this tower will soon become an integral part in one of the refinery's technical processes.

Chicago Bridge & Iron Company's service to the petroleum industry is complete . . . *designing, fabricating* and *erecting*. We are prepared to handle shop assembled refinery towers and pressure vessels built in accordance with API-ASME specifications or the ASME Code for Unfired Pressure Vessels. Each of our three fabricating plants has a stress-relieving furnace. The view at the lower right on the opposite page shows the furnace at our Chicago plant. It handles vessels up to 13½ ft. in diam. by 83 ft. long in a single charge. Longer vessels are stress-relieved in two or more heats. When specifications require it we can furnish vessels with special linings to combat corrosive conditions.

Write our nearest office for quotations on your next refinery vessel requirements.

CHICAGO

Plants in BIRMINGHAM, CHICAGO and GREENVILLE, PENNA.
In Canada: HORTON STEEL WORKS, Limited, FORT ERIE, ONT.



Above: Welder at work in our Chicago plant on a stainless steel section of a flare stack for an oil refinery. Upper right: Group of towers we built for a refinery. Right: Refinery drums leaving the stress-relieving furnace at our Chicago plant.

BRIDGE & IRON COMPANY

Chicago, 4	2128 McCormick Building	Tulsa, 3	1606 Hunt Building
New York, 6	3347-165 Broadway Building	Houston, 1	5619 Clinton Drive
Cleveland, 15	2204 Guildhall Building	Philadelphia, 3	1615-1700 Walnut Street Building
Los Angeles, 14	1423 Wm. Fox Building	Washington, 4	703 Atlantic Building
Atlanta, 3	2154 Healey Building	San Francisco, 11	1254-22 Battery Street Building
Birmingham, 1	1536 North 50th Street	Detroit, 26	1514 Lafayette Building

Deeper Drilling Necessitates that Greater Emphasis Be Placed on

DRILL-PIPE TESTING

by George Weber

THE trend to deeper drilling has imposed increasing demands on drill pipe. Improvement of its service life therefore requires a closer check on the condition of drill pipe, both new and used, to avoid failure of sections weakened by defects or damaged by corrosion or handling.

Many new methods for nondestructive testing of ferrous metals have evolved during recent years. Some are already in commercial use and others offer potential adaptation to such work. The future of nondestructive testing of drill pipe is classified into three types of inspection: (1) Initial mill tests to detect manufacturing defects, (2) precise periodic field tests to determine the serviceability of pipe over a period of several months, and, (3) continuous day-to-day inspection while pipe is in service to detect gross defects which threaten imminent failure.

The relation between various drill-pipe defects and service life has never been accurately determined by objective test programs during drill-pipe service. Scientific standards over and above the established industry requirements are not now available to determine which defects and in what severity render drill pipe unsuitable for normal service. Rejections are made on the judgment of inspectors of varied experience. Therefore the problem is not only one of developing new inspection instruments and methods. Intensive laboratory and field research to study the effect of various drill-pipe defects on failures is necessary to set definite standards for grading drill pipe.

Defects in Drill Pipe

Drill-pipe defects are of two distinct classes: Those occurring as a result of fabrication, and those resulting from handling, corrosion, or stress in service. Rolled-in scale, laps, seams, and cut plugs appear to have caused some failures in new drill pipe. This is indicated in cases where new drilling strings suffered several early failures, then continued in use through their normal service life without abnormal trouble. At present, steel mills employ careful control over the manufacturing and fabrication processes, followed by visual in-

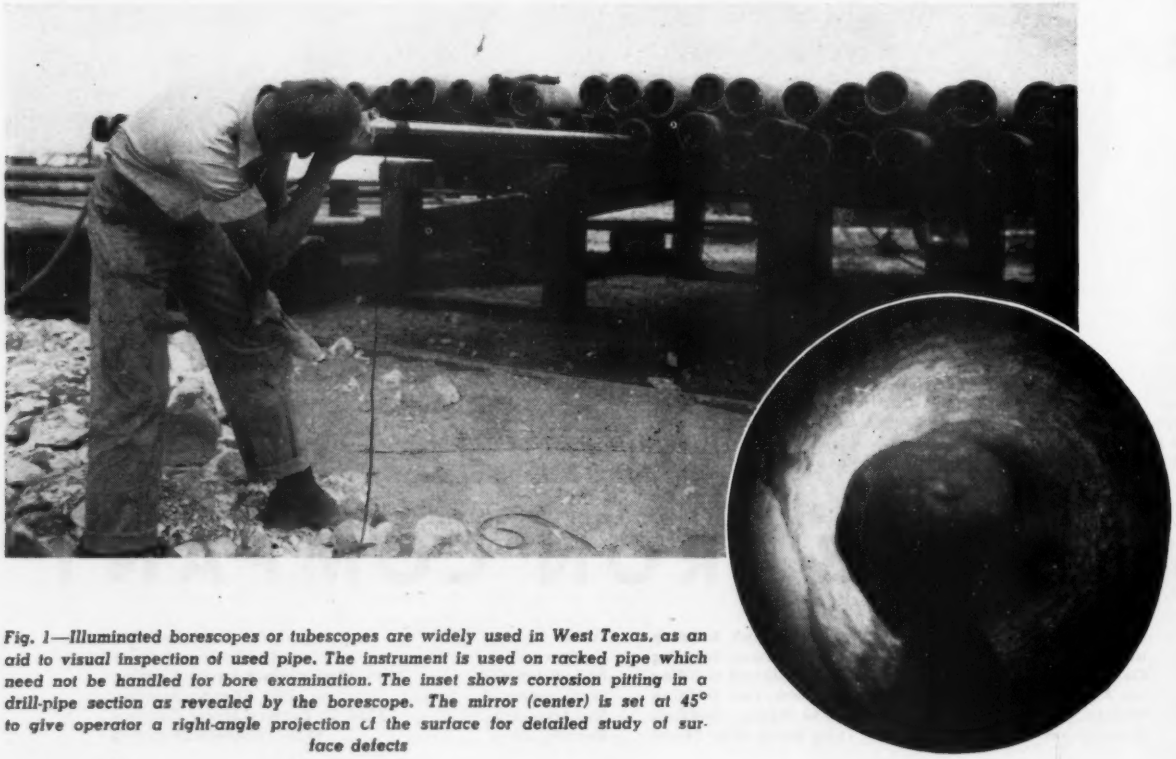


Fig. 1—Illuminated borescopes or tubescopes are widely used in West Texas, as an aid to visual inspection of used pipe. The instrument is used on racked pipe which need not be handled for bore examination. The inset shows corrosion pitting in a drill-pipe section as revealed by the borescope. The mirror (center) is set at 45° to give operator a right-angle projection of the surface for detailed study of surface defects

spection of the finished product. Such inspection covers dimensional tolerance, concentricity, thread accuracy, and examination of laps and seams. Laps and seams which have opened and whose depths exceed 12½ per cent of wall thickness are rejected. However, such defects which have not yet opened at the mill are often invisible and their depths are unknown without destructive testing.

The absence of any real knowledge of the relation between laps and seams and drill-pipe failures has discouraged further testing of these defects at the mill. Several possible aids to visual testing and a number of automatic testing methods are now available or will probably be available commercially in the future. Their feasibility is qualified by the correlation between the defects they will detect and the service life of the product.

Magnetic particle inspection and the fluorescent penetrant method are cited as aids to visual inspection, along with automatic testing methods which would indicate defects to be further inspected by skilled personnel. The latter methods involve techniques based on a number of principles, including surface magnetic field measurement, diffraction or back reflection of gamma rays and X-rays, hysteresis and eddy current losses, and conduction of heat, electric currents, vibrations, supersonic waves, X-rays and other radiations.

In addition to the regular inspection methods now in use, the adoption of a low-cost visual inspection aid such as Magnaflux or Zyglo is suggested. Either of these commercial methods could be employed in inspecting about one in every hundred joints of pipe passed by regular inspection. The new method could also be used in further study of joints rejected by the initial visual inspection, followed by grinding down or sectioning of defective areas and complete cataloging for future reference and analysis. Subject to determination of actual effect of each type of mill defect on service life, automatic scanning devices are suggested as possible important supplements to visual inspection in the future.

Field Inspection Methods

In general, mill defects are not considered responsible for drill-pipe failure after long service. Such failure results most often from development of fatigue cracks caused by surface abrasions and corrosion pits. Field testing should be of a type, therefore, which will determine, according to limitation standards, when such cracks, nicks, and pits make drill pipe unsafe for further use. At present, used-pipe standards of classification vary with the inspectors employing them. Pipe is generally graded into four classes. Grade 1 includes pipe in top condition, suitable for any drilling condition. Grade 2 is good pipe to be used safely for most types of drilling. Grade 3 pipe is often recommended only for shallow drilling and is not guaranteed for normal servivce. Rejects for any type of drilling fall in Grade 4. Such classification is made on the basis of one or more of three inspection methods now in use in the field. All three methods require that pipe be laid down and racked, and are therefore possible only at relatively long intervals. Consequently, inspectors' decisions must be conservative to cover serviceability over a period of several months.

The research program of the American Association of Oilwell Drilling Contractors for improving the service life of drill pipe is continuing through its preliminary phases. One of the important steps in the study concerns an evaluation of testing methods now in use and a discussion of possible new methods.

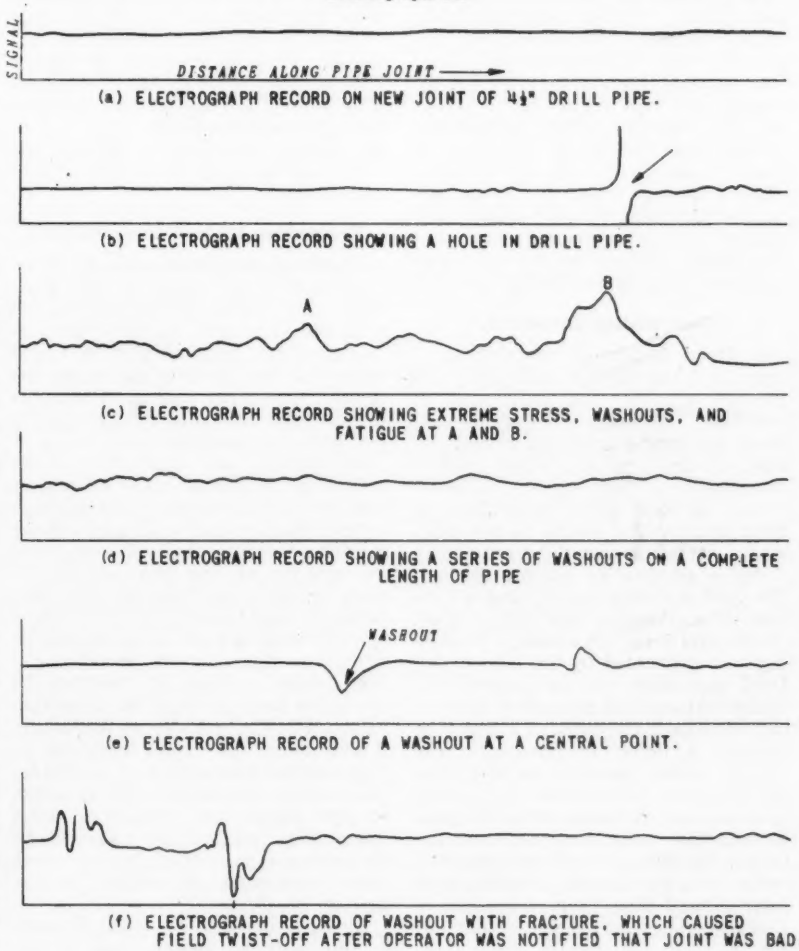
The report of the Battelle Memorial Institute covering the problems and possible methods for use in nondestructive testing of drill pipe is summarized here.

Such inspections are most commonly visual tests, involving the cleaning, brushing, or sand-blasting of all surfaces and examination of threads, joints, shoulders, outside surfaces, and in some cases, inside surfaces, employing illuminated borescopes or tuboscopes (Fig. 1). Visual inspections are time consuming and relatively expensive, but no instruments yet available will substitute for the basic examination of threads, shoulders, etc.

Magnaflux Inspection

Magnetic particle inspection is commercially available in many drilling

Fig. 2—Illustrative records of drill-pipe inspection. Furnished through courtesy of The Electrograph Co.



(a) ELECTROGRAPH RECORD ON NEW JOINT OF 4½" DRILL PIPE.

(b) ELECTROGRAPH RECORD SHOWING A HOLE IN DRILL PIPE.

(c) ELECTROGRAPH RECORD SHOWING EXTREME STRESS, WASHOUTS, AND FATIGUE AT A AND B.

(d) ELECTROGRAPH RECORD SHOWING A SERIES OF WASHOUTS ON A COMPLETE LENGTH OF PIPE

(e) ELECTROGRAPH RECORD OF A WASHOUT AT A CENTRAL POINT.

(f) ELECTROGRAPH RECORD OF WASHOUT WITH FRACTURE, WHICH CAUSED FIELD TWIST-OFF AFTER OPERATOR WAS NOTIFIED THAT JOINT WAS BAD.

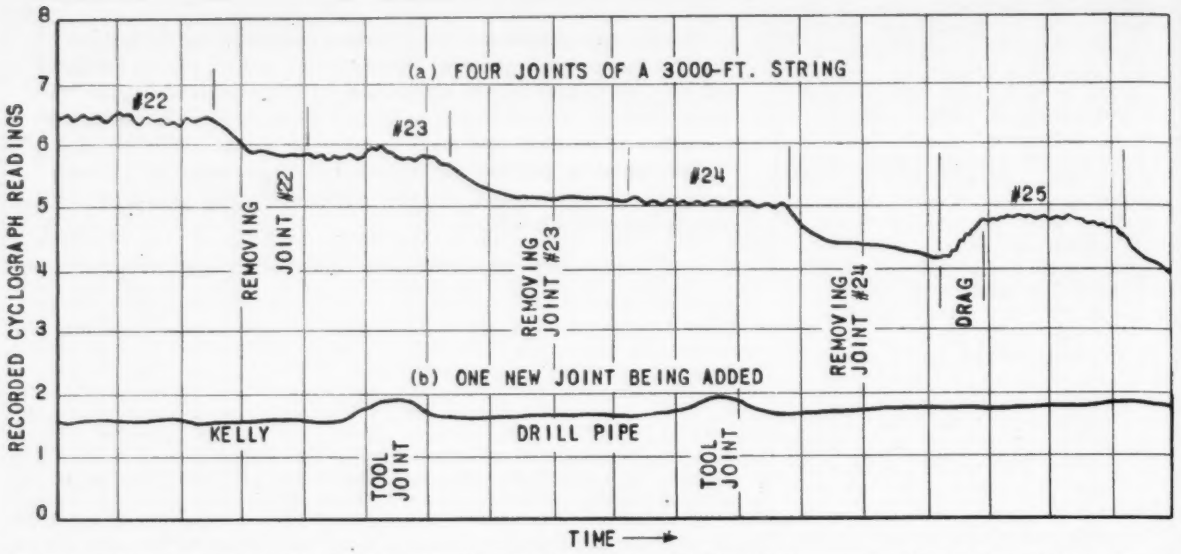


Fig. 3—Cyclograph records of string of 3½-in. diameter drill pipe pulling out of hole. Joints approximately 60 ft. long; 10½-in. diameter stationary test coil of 3 kc.

areas for use in conjunction with visual inspection of drill pipe. After racking and cleaning, the pipe is magnetized longitudinally by a movable external coil energized by a direct-current welding generator. Magnaflux powder, dusted on the pipe ahead of the coil concentrates about and reveals such defects as cracks, seams, and laps which might otherwise be invisible. This method improves both the speed and scope of visual inspection, although evaluation of defects found is still subject to the judgment of the inspector. By means of the illuminated borescope, the inside surfaces of the drill pipe may also be inspected by this method.

Gamma-Ray Inspection

A third inspection method, commercially known as the Electrograph method, employs the diffraction or secondary radiation of gamma rays from the pipe surface to reveal not only cracks, pits, and other surface irregularities, but, it is believed, points of local stress regradless of their causes. The inside of the pipe, where corrosion pits most frequently form, is scanned by pulling through the joint a device comprising a capsule of radioactive material, a lead shield, and a Geiger counter. Gamma rays are prevented by the lead screen from impinging on the counter directly, but strike it through secondary radiation from the exposed inside pipe surface. A defect or change in the crystal lattice spacing in the steel arising from local stress will result in changes in radiation from the pipe surface. The radiation signal from the Geiger counter is amplified and converted to a permanent record on each joint of drill pipe. Sample records of Electrograph charts are shown in Fig. 2.

To date only racked pipe has been commercially inspected in this manner, but there is a possibility that it may eventually prove feasible in inspecting pipe in the derrick or in the hole. Corrosion products and surface scale apparently do not affect the radiation, so prior cleaning of pipe is not necessary. Pipe handling is not required and the instrument is pulled through the sections at a rate of 1 ft. per second, affording a speedy and relatively inexpensive method of pipe inspection.

Prospective Field-Testing Methods

Numerous other principles might be applied to field testing of drill pipe. None are commercially adapted to such use at present, but promise employment not only as aids to visual inspection but as fully automatic detectors, inspecting pipe as it is withdrawn from the hole, stacked in the derrick, or suspended in the hole.

Electric-current conduction tests will detect cracks or voids which extend partially or completely through a wall thickness of drill pipe. Since sensitive detection is possible on about one-quarter of the pipe circumference, an instrument operating on this principle could scan a length of pipe spirally with one set of electrodes, or with four electrode sets, could scan a pipe length without its rotation. In the latter form it might be adaptable to inspection of the pipe as it is withdrawn from the hole. Equipped to give a permanent record of the string, it could be used to study the progress of pipe defects and provide warning when they reached the stage which threatened pipe failure. In this use it would supplement the periodic examination of pipe.

Electric conductivity might be used as the basis for another type of inspection involving eddy current induction. A secondary flow of eddy currents in small closed loops may be induced in the pipe by means of coils excited by alternating current. An instrument to measure such currents might be developed for pipe testing. It would provide essentially the same signals and records as the device measuring direct electric conduction.

It is possible that washouts and cracks extending through the pipe wall might be detected by leak tests performed under the derrick floor on pipe being withdrawn from the hole. Such a device would require pressure chambers surrounding the pipe, with suitable seals which would pass tool joints and the drilling bit. Leak tests might also be possible to perform on the inside of the drilling string, using a unit operating with compressed air or gas. Such devices pose a serious practical problem in maintaining a tight seal around the pressure area exposed on the pipe.

Calipering methods are adaptable to the detection of interior corrosion in drill pipe. An electromechanical caliper is cited as one of several such devices which might be used on pipe on the rack, in the derrick, or in the hole. The electromechanical caliper features a series of sharply pointed prongs or feelers set radially in a plane perpendicular to the pipe axis, and extended to the pipe surface or retracted by means of pneumatic or electromagnetic force. The feelers would be retracted for each change of position of the unit in the pipe to avoid wear or damage to the points. The measurable displacement of each feeler at each position along the pipe's length would detect cracks and wall thinning by either small isolated pits, or by extensive corrosion.

Supersonic waves which would be

A Summary of the Investigation of Drill-Pipe Failures In the Permian Basin* (From Battelle Memorial Institute)

by L. R. Jackson, H. M. Banta, and R. C. McMaster

AN investigation of the performance of drill pipe in the Permian Basin fields revealed that the relatively short service life of the pipe was the result of the severe corrosive conditions encountered. Drilling in this particular area is unique in that salt beds are encountered from about 1,800 to 3,400 ft. or deeper. The salt content of the drilling fluid attacks the steel pipe, the first stage of deterioration being manifested as corrosion pits. These pits produce a notch effect and concentrate the stresses normally developed during drilling so that fatigue cracks are developed at the base of the pits. The cyclic stresses cause further propagation of the cracks which leads to washouts and twistoffs.

The life of drill pipe being used under these conditions can be extended by minimizing the corrosion and reducing the operating stresses to the lowest practical limit.

By the addition of certain chemical reagents known as inhibitors to the drilling fluid, the rate of corrosion can be retarded. Laboratory rotating beam fatigue tests, of speciments subjected to salt-water corrosion, revealed that complete chemical protection could be obtained by the addition of sodium hydroxide. In actual drilling practice, it was found that this procedure was not practical because the amount of sodium hydroxide required to provide chemical protection caused flocculation of the clay particles normally in suspension.

Of the numerous inhibitors investigated, sodium chromate, a chemical already widely used to combat corrosion, appears to be the most promising, although it does not afford complete chemical protection. Small quantities of this inhibitor were found to be more effective than similar amounts of any of the other chemical additions studied. For drilling the salt section, it is recommended that a sodium chromate concentration of about 3,000 p.p.m. by weight should be maintained with the pH of the drilling fluid being neutral or slightly on the alkaline side, a pH of 7.0 or more. After the salt section is cased off, the mud pits should be thoroughly cleaned to insure a low salt content in the fresh-water mud. The concentration of sodium chromate should be maintained at the same level as in the salt section with a pH of 7.0 or higher.

*Made for the American Association of Oil Well Drilling Contractors.

Protection by Synthetic Resin

Since the most severe corrosion occurs on the inside wall surface of the drill pipe, the formation of pits in the outside being hindered by the continuous rubbing contact with the hole wall, protective coatings can be used advantageously on the inside surface. Certain types of thermal plastic resins, if properly applied to the inside surface, offer excellent chemical protection and are sufficiently resistant to the abrasion of the mud to be a satisfactory coating. Obviously, coatings are not applicable for the outside surface. Therefore, internally coated pipe may ultimately fail from the deterioration of the external surface, especially if the tool joints are appreciably larger in diameter than the pipe preventing the ends of the joints from close contact with the hole wall. For this reason, especially if coated pipe is used, it would be advantageous to use tool joints that closely approach the drill-pipe diameter.

The third procedure that might be used consists of using a separate string of pipe for drilling only the salt section. While drilling with this string, every effort should be made to keep the pipe in tension in order to prevent bending stresses that lead to fatigue failures. If the use of salt-pitted pipe is restricted to the upper portion of the hole, the pipe will not be subjected to the higher stresses that are frequently developed at greater depths. By operating in this manner, the maximum life of the pipe will be obtained under the existing corrosive conditions. In using this practice, it is essential that practically all of the salt be eliminated from the mud system prior to mixing the fresh water mud. The fact frequently overlooked is that some dilute salt solutions are more corrosive than concentrated solutions. New, fresh-water muds put into service immediately below the salt string frequently contain an appreciable amount of salt which accounts for some corrosion difficulties encountered below the salt section.

Regardless of which one of the three procedures is used, in order to obtain the best results, it is essential that the pipe be operated in tension to minimize the type of cyclic stresses that promote fatigue failures. This can be accomplished by using the proper combination of drilling weight and weight of drill collars.

Field trials will be necessary in order to determine which of the procedures will be the most economical. It may be found advantageous to use a combination of the practices outlined above. For example, it may prove desirable to use coated pipe for drilling only the salt section while using the chromate inhibitor throughout the entire operation. In making such tests, it is essential that all of the pertinent factors be controlled as closely as practical, and that adequate records be kept.

reflected from fatigue cracks and corrosion pits offer a further possibility in detecting drill-pipe defects. The presence and location of large radial cracks could be rapidly determined by longitudinal tests on the pipe while it is racked or standing in the derrick, or, with modifications, when it is suspended in the hole. Wave lengths required for this application are available in present commercial supersonic equipment. If higher wave length become commercially adaptable, transverse testing could be used. This would prove more practical in application and would allow the continuous scanning of the drill strings coming out of the hole.

Transmission of X-rays through the pipe wall offers another means of detecting wall thinning, cracks, washouts, pits, and pinholes. The method is considered practical only for pipe laid down on a rack.

A method developed during the war for testing flash welds shows possible adaptation to field testing of drill pipe. The instrument operates on the same principle as that employed in magnetic wire recording, measuring the surface magnetic field of a ferrous-metal body. It would require

(Continued on page 84)

Operators in Hull and Silk Field Study Repressuring Program

—$6,000,000 or More Profits in Sight

by C. H. Keplinger and J. M. Wanenmacher*

"How to handle oil pools on the most efficient over-all reservoir basis?" This question nowadays comes to operators and engineers with virtually every new field opened up. Generally, of course, there are several different operators in a given field, and first step in considering the various possibilities is to prepare, cooperatively, a complete petroleum engineering report. This article is a review of such an investigative report, which was prepared by the authors for a number of the independent operators in the Hull and Silk pool who are looking at the gas-repressuring possibilities there. For the group, John Thomas, president of Deep Oil Development Co., Wichita Falls, is acting as chairman of the executive committee, and W. C. Alexander, of Ligon Oil Co., Wichita Falls, is secretary.

THE Hull and Silk field is located in northern Archer County, Texas. Oil production was discovered in shallow sands in 1916. The field, as defined by the Railroad Commission of Texas, includes only those wells which produce from depths below 3,700 ft. The field as thus defined was discovered by Hull and Silk's (now Helmerich & Payne) 1 Wilson, Lot 11, Section 25, ATNCL Survey, and which was completed in a sand of Canyon age at 3,820-58 ft. This well was completed on April 6, 1938, with an initial flowing production of 244 bbl. of oil in 3 hours, through ¾-in. choke. The producing formation is called the "3,800-ft." sand.

A second well located on the same lot encountered a thick sand of Strawn age at 4,340-4,460 ft. The upper portion was oil bearing and the lower portion carried water, the oil-water contact being at about 4,417 ft. After exploring deeper beds including the Ellenburger and negative results, this well was completed at a

(Continued on page 79)

*Consulting petroleum engineers, Tulsa.

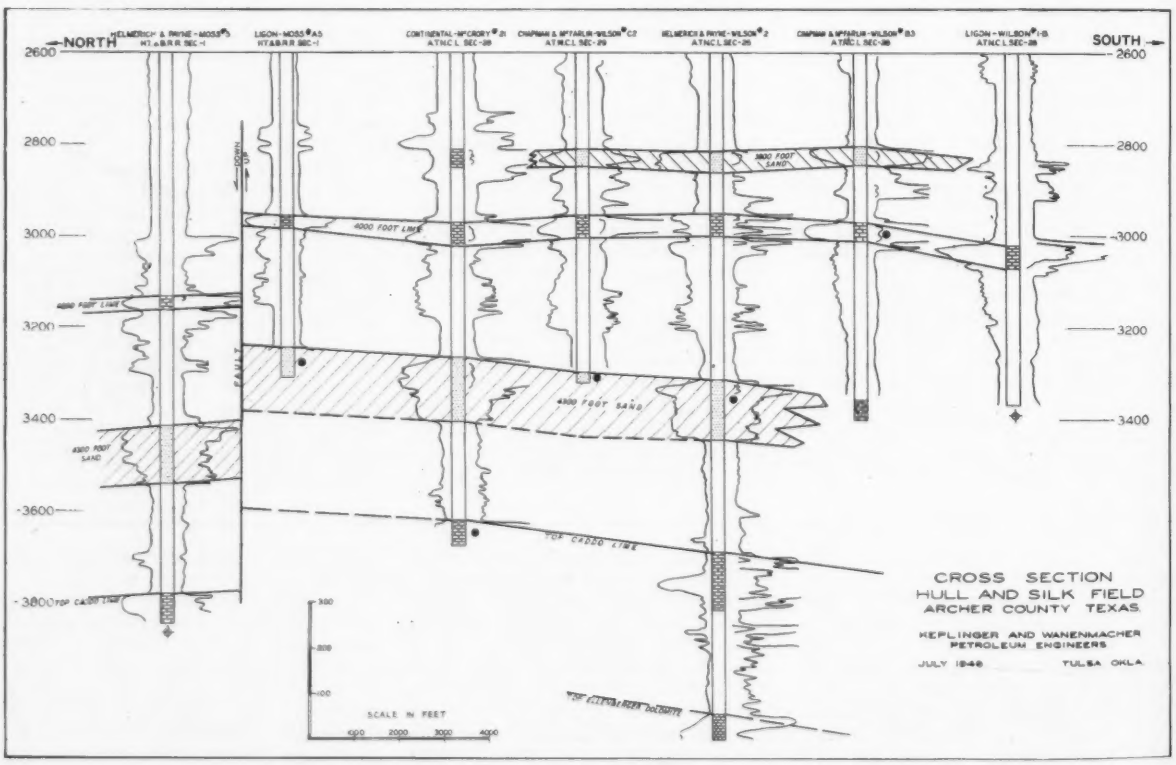


Fig. 1—Gas repressuring is being studied for the 3,800-ft. and 4,300-ft. sands

plugged-back depth of 4,415 ft. with an initial production of 138 bbl. of oil in 3 hours, flowing through ¾-in. choke. This producing formation is the most important of the field and has been designated the "4,300-ft." sand.

A third producing formation was discovered by Thurmond & Lipscomb's 1 Wilson, Lot 1, Section 22, ATNCL Survey, which was completed in a limestone encountered at 3,951-63 ft., with an initial production of 112 bbl. in 3 hours flowing through ¾-in. choke. The producing zone is commonly called the "4,000-ft." limestone.

In July 1940, Chapman & McFarlin's "E"-7 Wilson, E. Hall Survey, discovered production in the Caddo limestone 4,612-32 ft. where it was completed with an initial flowing production of 42 bbl. per hour.

Development was rather rapid and was almost completed by the end of 1940. The field extends 6 miles in a northeast-southwest direction, has a maximum width of slightly more than 2 miles and includes approximately 6,000 acres. The field includes 420 wells of which 280 produce from the 4,300-ft. sand, 108 produce from the 3,800-ft. sand, 20 produce from the 4,000-ft. limestone, and 12 produce from the Caddo limestone.

The field had produced 22,990,775 bbl. of oil on January 1, 1946, the yearly average during 1945 being approximately 11,000 bbl. per calendar day. The recovery on July 1, 1946, is estimated to be 25,000,000 bbl. This does not include oil produced from shallow sands or from the Caddo limestone. The production from three various producing formations has not yet been segregated. Consequently the recovery from the individual zones is unknown but has been estimated as of July 1, 1946, on the basis of the number of wells completed in each zone as follows:

3,800-ft. sand—	26.5%	or	6,625,000 bbl.
4,000-ft. sand—	4.9%	or	1,225,000 bbl.
4,300-ft. sand—	68.6%	or	17,150,000 bbl.

Nature of Formations and Geology

3,800-ft. sand.—This occurs as two separate sand bodies. The largest and most important extends throughout the southern part of the field. The other is in the extreme northeastern part of the field. The thickness and distribution of both sand bodies were mapped in detail. The large sand body is in fact a large lens, elongated in an east-west direction. To the north it grades into impervious limestone. To the west and to the south it shales out. The main sand lens thickens to the east and extends beyond the field. It is a rather pure sand with good porosity except in the most easterly part of the field where wells found it rather tight due to cementation.

The other productive sand lens present in the extreme northeastern part of the field is of slightly differ-

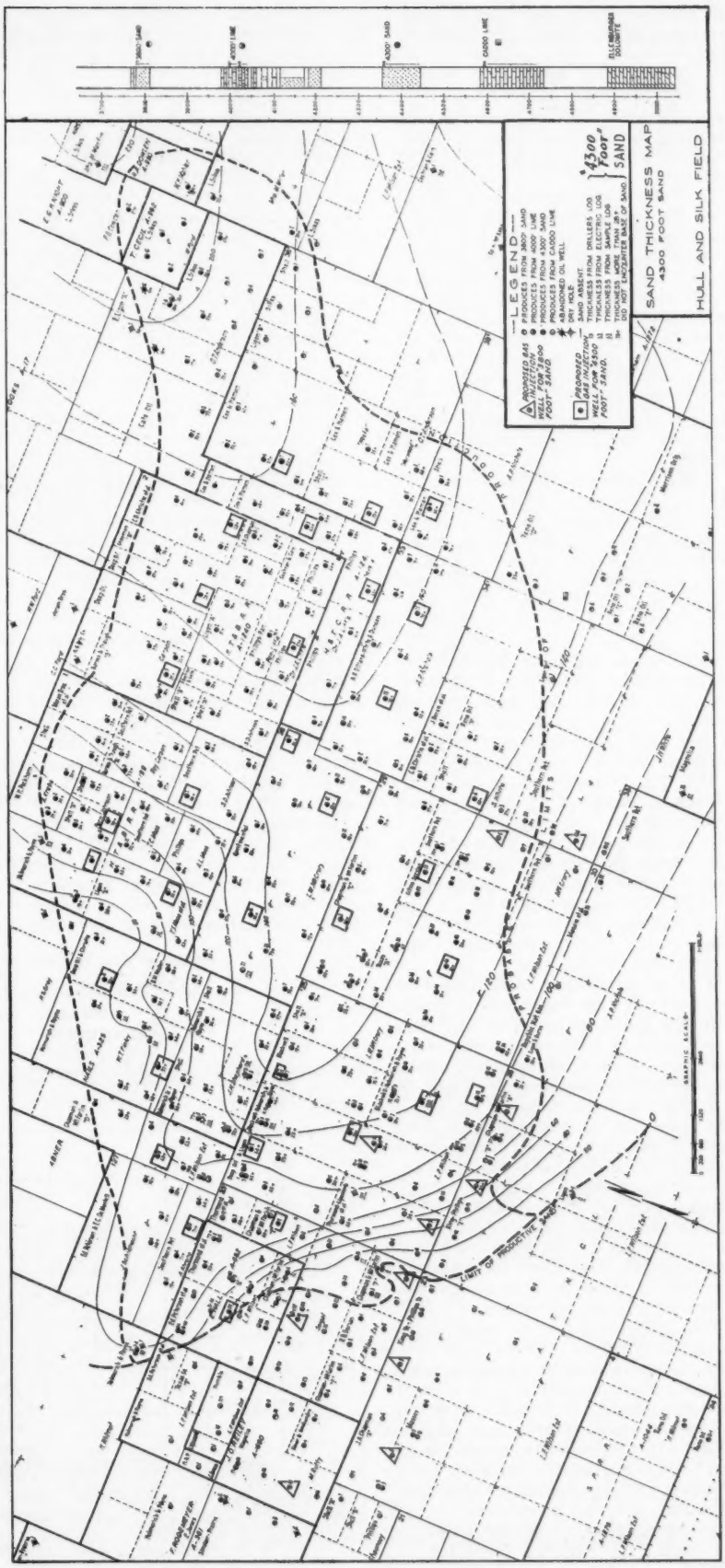


Fig. 2—Hull and Silk field has 420 wells, of which 108 produce from the 3,800-ft. sand and 280 from the 4,300-ft. sand

ent age and occurs about 100 ft. lower stratigraphically than the sand described above. This portion of the field is also low structurally, and as a result the sand occurs at a depth of about 4,000 ft. This sand body attains a thickness of approximately 50 ft. and has been produced by 13 wells.

In the north central part of the field the upper portion of a series of limestone beds, which is the stratigraphic equivalent of the 3,800-ft. sand to the south, is porous and oolitic. It was opened to production in Helmerich & Payne's 3 Moss in June 1943 and tested approximately 150 bbl. per day after acid treatment. This well now produces about 10 bbl. of oil daily and is free of water. The horizon offers possibilities of production in several other wells in the vicinity.

4,000-ft. limestone.—Minor production is obtained in parts of the field from porous, oolitic, sandy limestone beds in the thick limestone series approximately 200 ft. below the 3,800-ft. sand. Usually only the uppermost porous bed near the top of the limestone series is productive and lower porous beds are water bearing. The 4,000-ft. limestone has produced only in the western part of the field. However, electric logs indicate that it will be found productive throughout much of the field. The limestone series is regarded as the equivalent of the K.M.A. limestone by most geologists.

4,300-ft. sand.—This is the main producing zone of the field. It consists of fine to medium grained sand. The basal portion is conglomerate and contains numerous small chert pebbles. The upper portion of the sand consists of interbedded tight sand, sandy shale, and shale in the central part of the field.

It is thicker in the central part of the field than on the north or south flanks of the structure. The thickness is not definitely known in the eastern part of the field where it was not completely penetrated except in a few dry holes a mile or more beyond the productive limits of the field. These indicate a thickness of about 240 ft. as compared to an average of approximately 120 ft. in the central part of the field. This has been interpreted as indicating a gradual thickening northeastward.

In the western part of the field the sand body thins and finally becomes too tight to produce.

The thickening of the sand body apparently occurs at the top. The impure, shaly section which occurs in the upper portion of the central portion of the field is believed to be younger than the upper part of the sand body to the north, to the west and to the south. The 4,300-ft. sand is rather tightly cemented and a considerable portion is apparently too tight to produce. It is not uniform but varies in character from top to bottom. It also varies from well to well and there are a few instances where tests offsetting producing wells found this sand barren. Most of these extreme variations occur in the western part of the field and the sand appears to be more uniform in the central and eastern parts.

It should be emphasized that the total sand thickness does not portray the thickness of productive sand. Much of the sand body is below water level in the southern and eastern parts of the field. The general subject of water levels and pay thickness is discussed in a subsequent section.

Structure.—The geologic feature is an anticline elongated in a northeasterly direction. The southeastern flank dips gently, the rate of dip being about 100 ft. per mile at the depth at which the main oil sand occurs. The northwestern flank dips at the rate of approximately 300 ft. per mile for a short distance. It is displaced by a normal fault parallel to the axis of the anticline and approximately ½ mile northwest. The structure becomes more pronounced with depth and relief on the top of the Caddo limestone is almost twice as much as that shown by the 4,300-ft. oil sand.

The crest of the structure as contoured on the top of the 4,300-ft. sand is in the western part of the field. Most of the productive area occurs upon that part of the anticline which plunges gently northeastward from the crest. The accumulations of oil in the 3,800-ft. sand and in the 4,300-ft. sand are due to stratigraphic traps resulting from pinchout of the sands as well as the presence of structure. As a matter of fact the actual closure of the anticlinal structure at the depth of the 4,300-ft. sand appears to be small due to the small amount of reversal to the southwest.

Detailed Reservoir Data

3,800-ft. sand.—Electric logs, drill cuttings and cores indicate rather uniform conditions in the large sand body in the southern part of the field. The few core analyses indicate rather uniform porosity and permeability from the top to the base of the sand body. The average porosity indicated by analysis of cores representing a large part of the sand body in three wells is 15.8 per cent and the average permeability parallel to bedding planes is 177 md. Vertical permeability was measured in two of the three analyses and averaged 138 md.

Only a few wells are reported to be producing water from this sand and the amount of water is small. Three are in the extreme western part of the field and at structural positions much higher than wells further east which are water free. The two easternmost wells also produce water. There is no evidence of a water-drive or appreciable water encroachment and the reservoir has been producing by gas drive.

No samples of the reservoir fluid have been analyzed and few bottom-hole-pressure measurements are available. The latter are shown on Fig. 3 in which bottom-hole pressure is plotted against the cumulative production of the field. This procedure is justified because there is no accurate method of calculating the recoveries from the various producing horizons and these are commonly estimated as a fraction of the field's recovery. It is realized that the curve is based upon only a few measure-

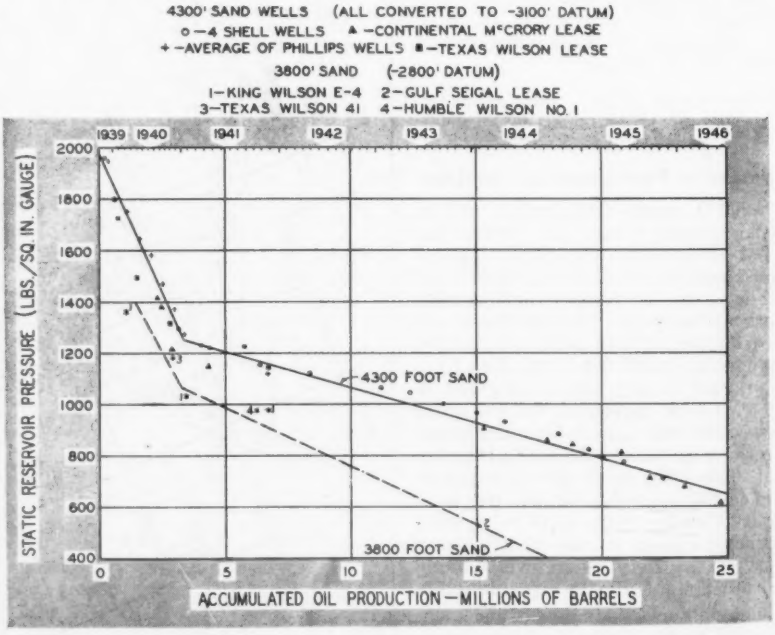


Fig. 3—Reservoir pressure vs. cumulative oil for 3,800 and 4,300-ft. sands

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At right, the 70-B with its mast in first position after raising. At left, the mast fully extended. The 70-B is optional with mast either a 55' or a 75' maximum height.

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and 7 yr. at 6,000	42,000	
Miscellaneous and unforeseen	25,000	568,500
Net profit from repressuring		$6,056,500

The above calculation is based upon the minimum expected increase in recovery. There is reason to expect a larger profit than this amount if the program is even moderately successful.

ments and is not an accurate record of the reservoir pressure comparable to the results which could have been obtained by periodic measurements throughout the field and the use of weighted averages. Nevertheless, this curve has some value since it supplies the only available information as to the saturation pressure of the reservoir fluid which appears to be about 1,050 psi.

The oil produced from this sand is similar to that produced from the 4,300-ft. sand and is believed that analysis of the reservoir fluid would probably be similar to those given later for the 4,300-ft. sand.

4,000-ft. lime. — This limestone is produced by only 20 wells scattered throughout the western part of the field. Furthermore many wells completed in this reservoir have produced considerable water suggesting the presence of a water drive. It was decided after discussion with operators assisting this investigation that gas injection in this horizon would not be practical and, consequently, it was not studied.

4,300-ft. sand. — Distribution and thickness are shown in Fig. 2. Cores of this sand from several wells have been analyzed. Most of the cores are from the upper part of the sand, a few are from the middle of the sand body and the lower portion has not been cored. The character of the sand is also indicated by electric logs of wells which penetrated the sand body, most of which are Caddo tests in the western part of the field. The porosity of the sand body ranges from 5 to 23 per cent and averages approximately 15 per cent. The horizontal permeability (measured with air) ranges from nil to more than 1,000 md., the average being about 125 md. The few determinations of vertical permeability indicate in general somewhat lower values.

The sand is not uniform and the core analyses indicate that zones of high porosity and permeability alternate with zones of low porosity and low permeability. The porosity of these more porous zones is commonly 18 to 20 per cent and permeability 200 md. or more. The data are too meager to permit detailed correlations throughout the field but they do indicate that the porous zones are not uniform and extensive for great distances. Bottom-hole-pressure data suggest that the various permeable zones are interconnected.

The original oil-water contact is apparent only in a few wells near the edges of the field. It appears to have been at about 3,350 ft. subsea in the extreme western edge of the sand body (near SE cor. Section 22, ATNCL Survey), at about 3,335 ft subsea at the south edge of the field, about 3,425 ft. subsea in the extreme northeastern part of the field, and at about 3,400 ft. subsea at the north edge.

Accepting the oil-water contact as indicated above, it is evident that the lower part of the sand body is below water level throughout most of the field. The thickness of sand above the original water-level appears to reach a maximum of approximately 120 ft. in the north central part of the field. The interval is less to the southwest even though structure rises in this direction because the sand body thins. The interval decreases gradually northwestward, southeastward, and northeast as the top of the sand body approaches the water level. Throughout the central part of the field there is a large area where the thickness of sand above original water level was more than 100 ft. The area where this interval exceeds 75 ft. includes a large part of the field. However, the topmost 10 to 35 ft. is tight and unproductive throughout most of this part of the field.

In general the amounts of water produced from wells in this formation are small. The most serious encroachment is in the northern part of the field where several wells are now producing moderate amounts of water and a few edge wells have gone completely to water. A few wells in the southern and eastern edges of the field also produce water in small quantities. Although there has been some encroachment of edge water, there is no evidence of a water drive and this reservoir has been produced by gas drive.

Original reservoir pressure based upon a bottom-hole pressure taken early in the history of the field is estimated to have been 1,980 psig. at 3,100 ft. below sea level. The present pressure is believed to be about 650 psi. at this datum. The bottom-hole-pressure data indicate a saturation pressure of about 1,250 psi.

Reservoir Fluid Data

Characteristics of the oil in the 3,800-ft. and in the 4,300-ft. reservoirs are approximately the same. The initial gravity of the oil was originally between 41° and 42° A.P.I. Gravity has gradually decreased with depletion of the field and is now 40° A.P.I. Analyses of bottom-hole samples of the reservoir fluid from the 4,300-ft. sand indicate that the oil was originally unsaturated with gas. The important physical characteristics are:

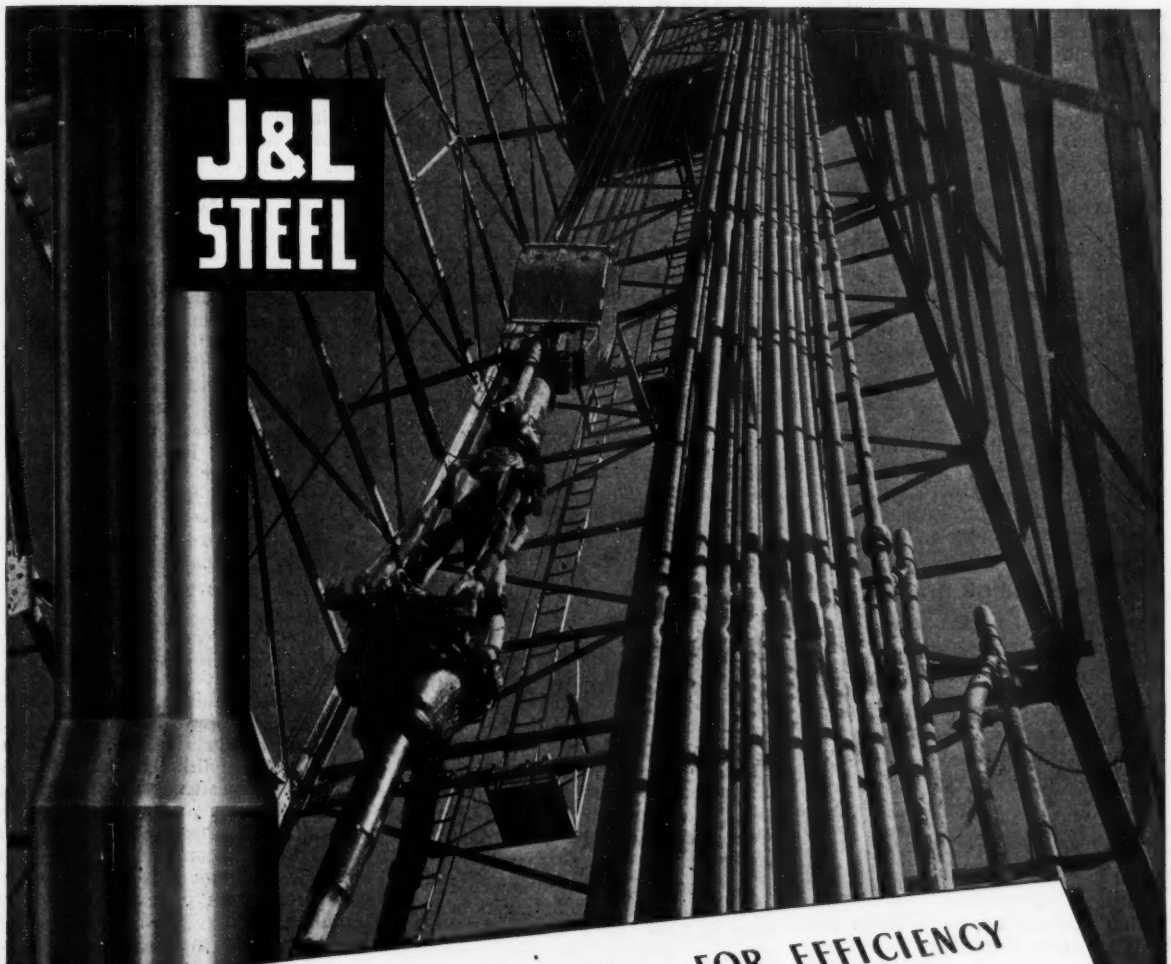
Reservoir temperature	132° F.
Saturation pressure at 132° F.	1,043 psi.
Solution gas-oil ratio at 132° F.	329 cu. ft./bbl.
Shrinkage after flash vaporization from 132° F. and 1,043 psi. to 60° F. and 14.7 psi.	18.0%
From 75° F. and 1,043 psi. to 60 F. and 14.7 psi.	15.5%
Formation volume factor 1,043 psi. 132° F./14.7 psi. 75° F.	1.219
Compressibility at 132° F. (1,500 to 2,000 psi.)	15.3×10^{-6}
Gravity of residual oil after flashing at 132° F.	38.9° A.P.I.
Viscosity of reservoir fluid at 132° F. and 1,100 psi.	0.66 cp.
Viscosity of reservoir fluid at 132° F. and 600 psi.	0.95 cp.

Another analysis of bottom-hole samples taken early in the history of the field indicates a saturation pressure of 1,210 psi. The bottom-hole pressure decline curve (Fig. 3) indicates a saturation pressure of about 1,250 psi.

The gas associated with oil is sweet and contains little or no hydrogen sulfide. After the heavier components are extracted by the gosoline plant and water vapor is removed from the gas, it should be a very satisfactory medium for repressuring.

Gas-Oil Ratios Studied

Gas-oil ratios have been measured at several different times in connection with surveys for gasoline-plant installation. Ratios from the leases which produce mainly from the 3,800-ft. sand are in general high and are believed to average about 2,000 cu. ft. per barrel at the present time. Apparently there has been no migration of gas to the higher parts of the reservoir, although there is undoubtedly considerable free gas in this reservoir released by the large



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decline in reservoir pressure below the saturation pressure. This suggests that gas injection would probably not result in serious channeling if properly operated and injection procedures were followed.

Average gas-oil ratio of leases producing mainly from the 4,300-ft. sand reservoir is now about 1,000 cu. ft. per barrel as compared to the original dissolved gas content of approximately 325 cu. ft. per barrel. Gas-oil ratios in this reservoir are in general lower in the eastern part of the field. Ratios in the crestal area are not appreciably higher than on the flanks of this structure and there is no indication of a tendency for a gas cap to form under normal operating conditions. This fact suggests that the gas injection will not result in formation of a gas cap. The gas-oil ratios have steadily increased as the reservoir was produced in all sectors of the field and indicate that the reservoir is being produced by gas-drive.

Estimated Oil Reserves

The majority of the leases in the field have made their allowable production since they were developed and it is impossible to ascertain the future recovery of the field from decline curves. The oil reserves have, therefore, been estimated by the volumetric method, as follows:

	Acres	Average thickness (ft.)	Volume (acre) (ft.)
3,800-ft. sand	2,200	25	55,000
4,300-ft. sand	4,800	50	240,000

The recovery expected under normal depletion conditions is 180 bbl. per acre foot based on the following factors:

	Per cent
Porosity	15
Connate water	25
Shrinkage factor	18
Estimated recovery factor	25

Applying the factors listed above, the estimated ultimate recovery and remaining reserves of these two zones is as follows:

Zone—	Est. ultimate recovery (bbl.)	Recovery as of July 1, 1946 (bbl.)	Est. reserve July 1, 1946 (bbl.)
3,800-ft. sand	9,900,000	6,325,000	3,275,000
4,300-ft. sand	43,200,000	17,150,000	26,050,000
Total	53,100,000	23,775,000	29,325,000

Material balance calculations of the amount of active oil in place using the compressibility factor and amount of oil produced from virgin reservoir pressure to 1,500 psi., indicate that these estimates are reasonable. Projection of the bottom-hole-pressure-decline curve for the 4,300-ft. sand indicates an ultimate recovery of approximately 50,000,000 bbl. for the field.

Economics of Repressuring

A total of 11 wells have been tentatively selected for injecting gas into the 3,800-ft. sand and 35 wells have been selected for injection of gas into the 4,300-ft. sand. Location of these wells is shown on the accompanying map.

It is estimated that in order to obtain the anticipated 5,300,000-bbl. increase in oil recovery, it will be necessary to inject approximately 22,000,000 M.c.f. of gas. It is believed that this gas be injected at a pressure of 750 psi. The main expense of the injection program will be the charges for compressing gas. Based upon a possible pressure service of 2 cents per M.c.f., the total cost of compressing the gas will amount to $440,000. Purchase of gas meters for injection wells and conversion of oil wells to gas injection wells should not amount to more than $250 per well. The cost may be increased, however, if it is found necessary to deepen proposed gas-injection wells so as to expose all of the pay section being produced by other wells in the vicinity.

Chemical Exposition Slated For September in Chicago

CHICAGO.—The Fourth National Chemical Exposition will be held this year at the Coliseum in Chicago simultaneously with the fall meeting of the American Chemical Society, September 10 to 14, it has been announced.

The show this year is expected to be much larger than that given in Chicago in 1944 and is sponsored by the Chicago section of the American Chemical Society. James K. Stewart is chairman of the "Trail Blazer" display which will include numerous exhibits of synthetic and natural-rubber articles and developments; utilization of farm and industrial wastes such as oat hulls and sulfite liquor from paper making, rare chemicals, and other features.

Drill-Pipe Testing

(Continued from page 75)

simplification before it could be adapted to field use, and would involve pipe-handling equipment.

Cyclograph Tests

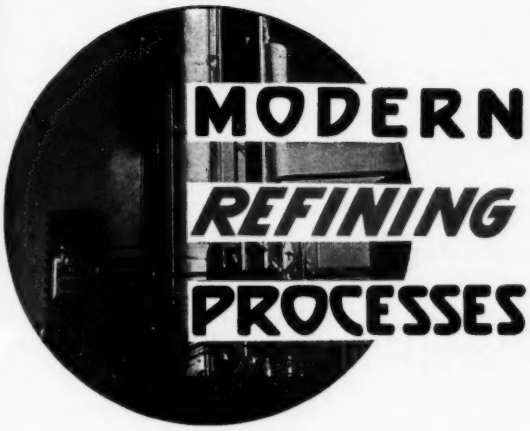
A promising prospect for continuous field testing is seen in the Cyclograph, which apparently measures the state of stress in drill pipe from hysteresis and eddy current losses occurring when the pipe is placed in an alternating magnetic field. The instrument has been used in laboratory and field tests on drill pipe and continued use of improved models is planned in the research program.

In laboratory tests on lengths of drill pipe subjected to torsion load, the instrument indicated points on the pipe which had exceeded the elastic limit. On pipe samples loaded to failure, the Cyclograph chart indicated the point of failure at a load of one-third yield point. In a special field test the instrument was set up immediately below the rig floor to scan drill pipe as it was withdrawn from the hole. Continuous Cyclograph readings as shown in Fig. 3 were obtained. Results indicated a need for further refinement and an improved model has been devised for this specific type of test. Inspection of pipe in service will be continued using the new instrument.

In addition to the Cyclograph, the Electrograph is believed capable of measuring the state of stress in drill pipe by back reflection of gamma rays. Both instruments are expected to be modified for use in continuous inspection of drill pipe in service. Both appear more sensitive when drill pipe is under stress, although they are relatively less sensitive to actual cracks and holes than some other instruments. Further tests of drill pipe in the field is recommended for both methods to prove that they measure conditions in the pipe contributing to imminent failure. Field application of the supersonic method to drill-pipe testing is also recommended, if commercial equipment of that type is developed for such use. Preliminary laboratory and check tests of the other methods outlined, such as electric current conduction tests, leak tests, and caliper tests are suggested before field application is studied.

It is concluded that the most promising inspection methods both for mill and field application appear to be those which will scan drill pipe and automatically indicate dangerous defects by means of sound or flash warnings or prominent markings on the pipe at defective points. The adaptation of sensitive instruments to drill-pipe inspection are feasible only after dangerous defects have been differentiated from defects which have no effect on drill-pipe service life. Automatic testing devices providing warning of imminent failure can be safely adapted to field use only after suitable standards have been set for defects classed as dangerous.

(A full draft of the report condensed in this article, written by L. R. Jackson, H. M. Banta, and R. C. McMaster, is published in the official publication of the American Association of Oil Well Drilling Contractors, The Drilling Contractor, August 15, 1946).



PART 13 IN A SERIES

HYDROFORMING is essentially a catalytic dehydrogenation process for converting naphtha hydrocarbons to aromatics and naphthenes, and changing olefins to cyclic and aromatic compounds. It is extremely useful in removing sulfur from such products, sulfur forming sulfides with the molybdic oxide - on - alumina catalyst and being burned off during regeneration. Hydroforming improves the TEL susceptibility of motor fuels when carried out at the lower temperatures mentioned in this article, and also makes large amounts of toluene, some xylenes, etc., when operated at the more severe conditions. Hydroforming may permit greater use of excess butanes, because of the relatively low vapor pressure of hydroformate. Its octane rating may vary widely, up to 80 A.S.T.M.

The HYDROFORMING PROCESS

by George Armistead, Jr.

THE hydroforming process has been in commercial use since 1940 and was the first of the commercial catalytic processes directed primarily at the improvement of low-grade straightrun gasolines. During the war, the then-existing hydroforming capacity, as well as additional capacity built for the purpose, served the vital purpose of producing toluene for explosives and high-octane aviation-base blending stock as well as xylenes and other aromatics. There are presently a total of eight hydroforming units in operation which, since the end of the war, have resumed their original duty in octane improvement and sulfur reduction on naphtha motor gasoline.

Since the commercial beginning of the hydroforming process on the initial unit built at Texas City, announced by Smith and Moore[1], little has been available in the literature concerning its fundamentals until the recent publications by Hill, et al[2], Saegebarth[3], Hartley[4], and others[5], which have furnished informative descriptive data on both its peacetime and wartime mechanism and uses. It is of interest to summarize this available information both with regard to the method of operation of hydroforming and its commercial utility.

The Process

The hydroforming process is essentially catalytic dehydrogenation. Its basic principle consists of passing hydrocarbon vapor over a suitable dehydrogenation catalyst, e.g., coprecipitated silica and molybdena, at temperatures of 900° to 1,100° F. in the presence of a substantial quantity of hydrogen-rich gas derived from the process. The principal reactions involved in the process which control its commercial utility are as follows:

1. Dehydrogenation and cyclization of straight-chain hydrocarbons, dehydrogenation of naphthenes, and other molecular rearrangements resulting in large octane increase accompanied by conversion of olefins to paraffins or ring compounds favorable to lead susceptibility.

2. The controllable production of certain selected aromatics such as toluene by the processing of a selected feed stock.

3. The decomposition of sulfur compounds present in the feed, with resultant improvement in quality of the product.

A flow diagram of a typical hydroforming unit is shown in Fig. 13-1. Referring to this figure, it will be noted that fresh naphtha feed, after rerunning and stripping of oxygen, passes first through the furnace coil where it is heated to 950°-1,050° F. and passes thence to the reactor, at which point it is joined by recycle gas, containing, for example, 60-80 mol. per cent hydrogen, which has been heated to 1,050°-1,070° F. Space velocities (liquid vol./hr. feed to a reactor ÷ vol. of catalyst in reactor) may be 0.5 to 1.0. The reactor is filled with granular or pelleted catalyst particles of approximately 2-4 mesh size and may be divided into a plurality of catalyst beds which in most cases operate in series, with reheat furnace coils between them.

In some instances[3], the plurality of beds may be so arranged as to give the effect of parallel operation of a number of beds of 3-ft. heights. Several types of catalyst have been used for this type of reaction including the oxides of chromium and molybdenum on alumina, but the generally used catalyst has the chemical composition of about 10 per cent MoO_3 coprecipitated with Al_2O_3. This catalyst also has the property of forming sulfides from sulfur-containing hydrocarbons under the reaction conditions employed. It is rugged and has been used for periods of more than a year without replacement.

The reactor is usually operated at 150-300 psig. and an inlet temperature of 950°-1,050° F., depending upon the character of feed and severity desired, the lower inlet temperatures being employed for motor-gasoline operations and the higher inlet temperatures in the operations on selected feed stocks for the production of toluene. In passage through the reactor, molecular rearrangements occur, accompanied by an over-all net absorption of heat, the amount of which depends on feed-stock character, with the result that the temperature falls 100° F. or more during the passage through the vessel. In order to maintain the temperatures necessary in the production of toluene, a number of units are employing two reactors with a reheat coil between them to maintain a higher mean reaction temperature.

In the course of passing through the catalyst, coke is deposited which naturally reduces catalyst activity and requires regeneration by burning off coke with air at intervals of 4-8 hours' reaction time, at which time the hydrocarbon flow is switched through an alternate reactor, and regeneration proceeds. The total number of reac-

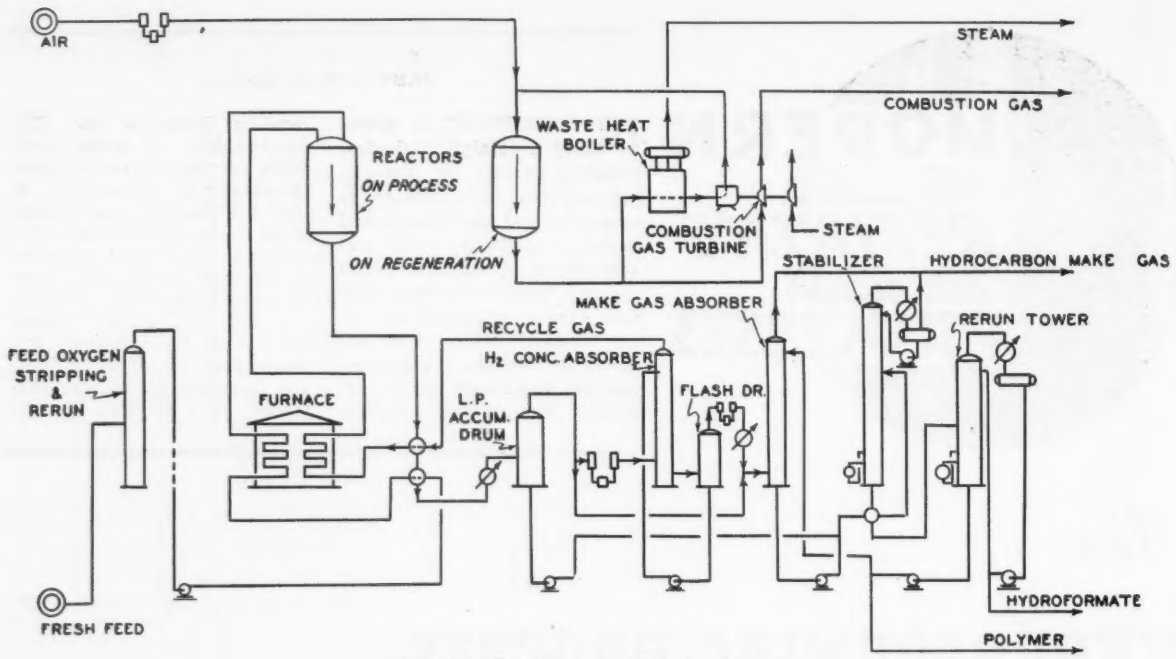


Fig. 13-1—Flow diagram of hydroforming unit

tors employed in this way is usually four. In the process portion of the hydroformer cycle, the discharge from the reactor system is cooled and passes to a separator drum, from which the hydrogen-containing recycle gas is taken. This gas may pass through an absorption system for increase of hydrogen concentration before actual return to the recycle gas furnace. The hydroformate production and the gas production from the high-pressure separator are handled in conventional gas-recovery equipment to produce a depropanized hydroformate.

The regeneration step, or burning of the carbon deposit from and reoxidation of the catalyst in the hydroforming process is accompanied by first purging hydrocarbon gases from a reactor to be regenerated, then circulating through it a mixture of inert gas (mainly nitrogen and carbon dioxide) containing about 1-2 per cent of oxygen. The inlet temperature of such a mixture to the reactors may be in the range of 700° with an outlet temperature of 1,000-1,100°. The proportion of inert gas to oxygen permits absorption of the heat liberated in the oxidation, with the maintenance of the terminal temperatures.

The burning of coke from the catalyst proceeds on more or less a definite flame front progressively through the reactor from the air-gas inlet and the temperature of the catalyst in the first-burned area thereafter tends to approach that of the entering combustion-supporting mixture. As a consequence, it is necessary to reheat each reactor to substantially process temperature with recycled combustion gases before it goes into process. The air-gas mixture, as is shown by Fig. 13-1, is derived from recirculation of part of the flue gases produced plus introduced high-pressure air. Regeneration is customarily carried out at various pressures up to about 250 psig. Heat is withdrawn from the coke-burning cycle by the passage of the reactor effluent gases through waste heat boilers.

The high-pressure, high-temperature combustion-gas production may also be used to operate the turbine used for the recirculation of this material to the reactors. All of the reaction and regeneration cycle must be controlled carefully by a time-cycle mechanism, and a large number of remote-operated steam-sealed valves similar to those used on other fixed bed catalytic processes are employed in the system.

Reactions Involved

The mechanism of the hydroforming process, as mentioned previously, is basically dehydrogenation accompanied by some cyclization of straight-chain hydrocarbons, the conversion of olefins to paraffins and cyclic materials, and by some cracking of nonaromatic hydrocarbons. There is evidence also of alkylation[3] as indicated by the formations of xylenes and higher hydrocarbons from stocks containing no hydrocarbons higher than methylcyclohexane.

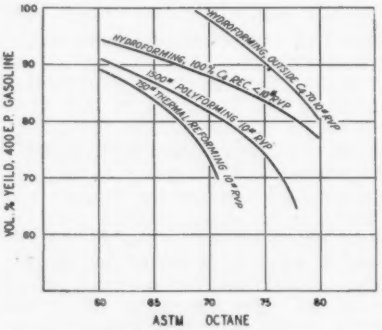


Fig. 13-2—Hydrocarbon yield—octane relations in comparison to other octane-improvement methods. Basis: 33-35 A.S.T.M. octane heavy straightrun naphtha feed

The actual measure of reaction severity is the average catalyst temperature rather than the composite vapor inlet temperature. In operations for the production of toluene, on selected feed stock, the dehydrogenation reaction predominates and there is no other reaction to balance its absorption of heat, such as the hydrogenation of olefins, consequently, the tendency for temperature drop through the reactor is greatest and the higher catalyst inlet temperatures are thus required in this type of operation. On the other hand, high-octane-improvement operations on straight-run naphtha generally do not employ the highest inlet temperatures although average reaction temperatures may be higher than those in the toluene operations.

The maintenance of a high partial pressure of hydrogen with the recycled gas tends to suppress coke formation which would otherwise proceed with normal reaction products only over the catalyst employed.

The actual formation of coke is relatively low compared to other commercial catalytic operations, ranging from about 0.7 to 1.7 weight per cent[3] and is dependent upon the severity of the operation as related

to space rate and temperature. Hartley[4] indicates the mechanism of coke formation to be progressive dehydrogenation associated with condensation or polymerization of aromatics. Hill, et al.[2] states that upward of 90 per cent of the sulfur in feed stock is removed through the formation of sulfides with the molybdenum in the catalyst, consequently, the reoxidation of the sulfides is an important part of the regeneration step.

Yield-Octane Relationships

The yield-octane relationships and related features including Reid vapor pressure, comprise one of the most important advantages of the hydroforming process and have been discussed in considerable detail by Hill et al.[2] In summary, as pointed out therein, the product from the hydroforming of heavy naphthas shows less production of high gas, coke, and tar and consequently higher volume per cent gasoline yields for a given octane improvement than do competing octane improvement processes.

In addition, the production of butane in the hydroforming operation is comparatively small, running in the neighborhood of 3-7 volume per cent, depending upon severity, with the greater production under the more severe operating conditions, and as a result, the total C_4-400 hydroformate is usually substantially below 10 lb. R.v.p. It is therefore possible to blend in 3-9 per cent butane to bring the hydroformate up to 10 lb. R.v.p., and correspondingly more for higher vapor pressures. This has the advantage not only of permitting the inclusion in gasoline of outside butane which is frequently available at low cost, but it also improves the ultimate yield-octane relationship because of the high blending value of butane (approximately 95).

Fig. 13-2 illustrates the obtainable yield-octane relationship from hydroforming compared to thermal reforming and polyforming on similar feed stocks (approximately 34 A.S.T.M. octane). Referring to this figure, it will be noted that two curves are shown for hydroforming, the lower of the two being for 100 per cent butane recovery hydroformate which is below 10 lb. R.v.p. throughout. The upper curve shows the yields and octane numbers for the hydroformate pressured with outside butane to 10 lb. R.v.p. It will be seen on this curve that approximately 100 per cent yield on the basis of hydroformer feed is obtainable at approximately 68.5 A.S.T.M. octane, representing an improvement of 34.5 A.S.T.M. numbers without loss in volume and at the expense of the hydroforming operation plus the butane used for pressuring.

It will be noted from Fig. 13-2 that both hydroforming yield-octane relationships are markedly superior to the polyforming line and the thermal reforming line. These latter two lines also show the characteristic of reaching practical octane ceilings which are considerably lower than the level readily reached by hydroforming. The naphtha thermal reforming line includes no polymerization of olefins or excess butane-butylene, and if these supplementary processes were used, the thermal reforming line would then tend to approach the polyforming line.

When directed primarily at the production of motor gasoline, hydroforming may be carried out on either full-range gasolines or the heavy naphtha fractions, the general considerations being the usually greater desirability of improving octane on the heavy naphtha fraction and the benefits of effecting as much sulfur removal as possible for the whole gasoline cut. The lighter fractions of gasoline (below 200°) show somewhat less response to octane improvement by mild hydroforming, as measured by actual numbers increase than the higher-boiling gasoline fraction, although initial octanes are higher on such light fractions, and the product therefrom for equal hydroforming yield tends to be higher octane than for the heavier stock. Under more severe conversion conditions, with yields of C_4-400 in the range of 75-90 per cent, the heavier feed stocks, due to their greater responsiveness to octane improvement by hydroforming, reach and exceed the octane levels obtained at equal yield from the lighter gasoline feed stocks, presumably due to greater cyclization and formation of aromatics.

The A.S.T.M. octane of hydroformed gasolines can be varied, as mentioned previously, between rather wide limits up to about 80 A.S.T.M. The corresponding C.F.R.-R. octanes run about 5 numbers above the A.S.T.M. values and are inclined to be somewhat low for a catalytic product, due to the saturated character of the product which runs generally from 1-5 bromine number. Lead susceptibility is good for a cracked product, with maximum A.S.T.M. octanes of about 89 and C.F.R.-R. octanes of about 93 being achievable with 3 cc. TEL. Where specifications are governed only by A.S.T.M. octanes, the clear octane and lead susceptibility characteristics are very advantageous economically, compared to other processes, and somewhat less so if specifications are governed by the C.F.R.-R. method.

As mentioned in the foregoing, hydroforming was employed almost exclusively during the war for the production of toluene for explosives. This operation involved the charging of the selected feed stock generally boiling between the limits of approximately 185° to 235° F. which contained substantial amounts of natural toluene as well as certain cyclic compounds which could be converted to toluene. The principal hydrocarbon of interest for such conversion was methylcyclohexane which required only dehydrogenation to form the aromatic ring. Operations for the production of toluene use somewhat higher catalyst-bed inlet temperatures, than employed in motor gasoline improvement and sometimes employ rather extensive repassing of hydroformate in order to obtain maximum yields of toluene. This operation has been covered in considerable detail by Hartley[4].

Desulfurization

The desulfurization effect of the hydroforming process is of great economic importance to the process. As pointed out by Hill, et al.[2], approximately 90 per cent of the sulfur contained in the feed stock is removed, with a resultant beneficial effect on lead susceptibility and related properties of the gasoline sought by the refiner. With the prevailing tendency toward the use of higher-sulfur crudes, bth domestic and foreign, the hydroforming of straightrun gasoline plus the catalytic cracking of heavier stocks have prospect of greatly simplifying the refiners' sulfur problem.

The effect of hydroforming in lowering the boiling range of heavy naphtha feeds is of somewhat the same degree as naphtha reforming in the middle portion of boiling range. With the lesser production of light ends, the lowering of the front end of the boiling-range curve is not so great as in the case of thermal reforming.

Along with the production of hydroformate, gas, and coke, is the production of a highly aromatic, higher-boiling material, known as polymer, which appears to originate partly from materials boiling about 400° in the feed but chiefly as a result of alkylation of lower aromatics and other reactions in the operation. This material, according to Arveson[6], boils from 400° up to 750° and has an A.P.I. gravity ranging from 11 to 14.9 and specific diffractions from 264-230, indicating its highly aromatic character. Such material is usable for solvents and similar purposes direct after a certain degree of fractionation. However, Saegebarth[3] has pointed out that either in normal operations or those with specially selected conditions and feed stocks, it is possible to produce a number of specific aromatics including the three xylenes. One of these, ortho-xylene, has been derived commercially from the hydroforming process as a raw feed stock supply for the manufacture of phthalic anhydride.

It is of much interest in connection with the high-boiling constitutents of feed to note the fact pointed out by Hill, et al., that moderate increase

(Continued on page 100)

PLASTIC PLUGGING

—Reduces Gas-Oil Ratios

by E. S. Bauer*

PLASTIC plugging is an effective and at the same time economical method of sealing off unwanted water and gas intrusion into oil pays. Extensive work done in the west Texas oil fields, using Resinox (a phenolic, low-temperature curing resin), has proved that effective control of gas-oil and water-oil ratios can be gained within a price range economically practical to oil producers.

The highly acid gases prevalent in the oil fields will not dissolve the plastics to cause new fissures. Plastic plugging is less expensive than tamping lead filaments and turnings into wells and, unlike this method, a well that has been plugged with plastics, be it a gas-shut-off; a bottom-hole-water shut-off, or a mid-section water shut-off, can be easily drilled deeper at a later date.

To run in for a gas plug, a temperature survey must be first made by using a continuous-recording temperature bomb. Since the gas area is generally at a lower temperature than the oil level, a study of the temperature curve will indicate the approximate location of the gas-oil contact. The well is pumped full of oil to overcome and seal off the gas pressure. Depending upon the depth of the well and the amount of pressure experienced, between 6 and 8 hours will be required for this operation.

While oil pressure is maintained, the tubing is pulled from the well. In most cases it will not be necessary to maintain positive pressure since the pressure caused by the hydraulic level of the oil will usually be sufficient. Depending upon the type equipment used, total setup time and pulling time will require between 8 and 24 hours. With new, high-speed equipment, this time is reduced materially, and it is possible to pull 5,000 ft. of tubing in about 2½ hours.

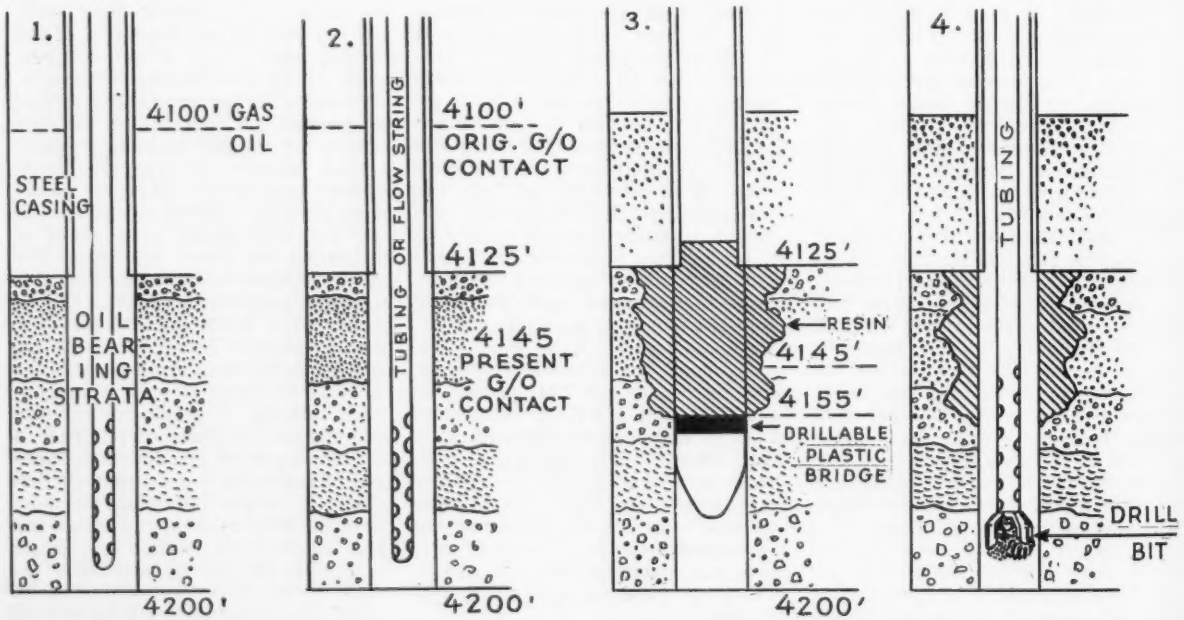
A special drillable plastic bridge is run in on a wire line to a point slightly below the gas-oil contact and is sealed to the wall with plastic cement. This prevents the resin sealer, which will be added later, from going into the oil pay. The tubing is now reinserted until it rests on the top of the bridge. Using a specially constructed pumping truck, the plastic is then pumped through the tubing into the well. The well is capped and between 200 and 800 psi. pressure is applied. This forces the Resinox out through the porous structure from which the gas is intruding.

A steel measuring line is run into the well to determine the amount of fill-up.

When the fill-up is complete, the flow string is again removed. The resin is allowed to cure for from 6 to 8 hours. A drilling bit is attached to the flow string and is inserted in the well. The core of the fill-up and the plastic bridge are drilled out, the well is swabbed several times and the well is back in production. Total time required for the service work on an average well is about 36 hours.

At one time, gravel was pumped into the bottom of the well for the cap and the resin was introduced into the well by means of a dump bailer. The new method of using a plastic bridge and pumping the resin filler in through the flow string has cut the time of the operation to about half.

*Monsanto Chemical Co., Plastics division, Springfield, Mass.



1—New oil well, 4,200 ft. deep, with gas-oil contact point at 4,100 ft., is shown in cross-section sketch. Initial production is 50 bbl. of oil and 37,500 cu. ft. of natural gas daily, a ratio easily within limits set by State Conservation Commission

2—After 6 years' production, gas oil contact drops to 4,145-ft. level and gas intrudes via permeable zone which previously was oil saturated. Well now yields 20,000 cu. ft. of gas to each barrel of oil, reducing oil allowable from 50 to 5 bbl. a day

3—Tubing is removed and drillable plastic bridge (with remotely-controlled "dogs" that bite into walls) is spotted at 4,155-ft. level. Plugging agent is introduced and pressured into permeable zone, hardening in about 8 hours

4—Drill attached to reinserted tubing reams out hole through the plastic and disintegrates bridge. The remaining hardened phenolic resin seals off the zone. Normal 50 bbl. per day oil production is resumed due to the lowering of gas-oil ratio

When a well is producing an unusual amount of water, the first remedial step is to locate the area of water intrusion. To set a bottom-hole plug, first step is to remove the tubing from the well. The bottom of the well is cleaned out to remove mud or cement. Where the well contains an old cement plug, about 10 or 12 ft. is drilled off the top of the old plug. A sand pump is used to remove sand and mud. A quantity of resin is delivered into the well using no more than would be required to fill the hole to the desired depth if none of the resin went into the rock pores, and the resin is allowed to set for 3 hours. Using depth-measuring equipment, the new depth is determined. The amount of additional resin needed is calculated and is added to the well, allowed to set and new measurements are taken. This cycle continues until the required amount of fill has been realized. The tubing is replaced and the well tested.

In some wells, water will be located in a section considerably above the bottom of the well. Under this condition, the procedure outlined for gas plugging is used.

Typical of a gas-oil reduction job is that done on a West Texas well that was producing 9 bbl. of oil per day and 37,000 cu. ft. of gas per barrel. After the plugging was completed, production was up to 60 bbl. per day and the gas production was down to 1,750 cu. ft. per bbl. This raised the well's income per month to $1,575.00 from $236.25.

One well in a west Texas field was making 90 per cent water on the pump. After a plastic bottom-hole plug was run in, the well made only 1 per cent water under natural flow and operating costs of more than $200 per month were eliminated.

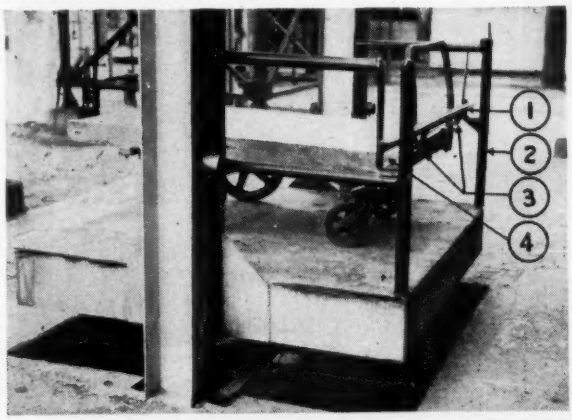
Acknowledgment

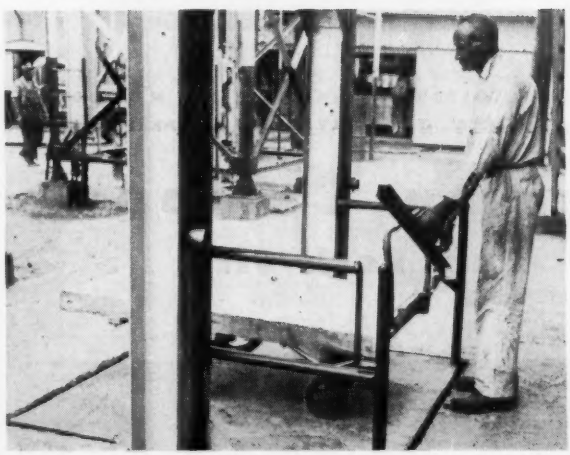
Acknowledgment is hereby made to Fred R. Holland, Oil Well Chemical Service Co., Fort Worth, Tex., for the field data used in this article.

Plant Practices

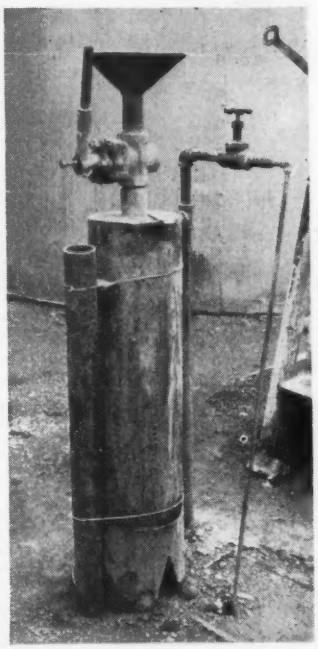
Safety Lock for Hand Trucks

A SAFETY lock to prevent hand trucks from rolling on platform elevators has been developed by engineers of Magnolia Petroleum Co.'s Beaumont refinery from plans submitted by a boiler-shop employe. The device consists of a hinged "L"-catch (1), fastened to the elevator rail (2), which, when lowered, engages both U-brackets on the hand truck's front (3) and a hand rail slot (4). Metal bars on the elevator platform hold the rear wheels immovable during elevator operation. Primarily adopted as a safety factor, the device does not interfere with hauling. It is now being used in the water-treating plant, but extension of its use to other refinery points is planned. The pictures show the lock in both open and closed positions.





Reagent Mixing Units for Doctor Sweetening



FOR continuous mixing and addition of doctor reagent solutions in the sweetening of gasoline, a 10-in. pipe is cut and welded wedge fashion at the bottom, a flat head is welded into the top, which is fitted with a 2-in. nipple, a Walworth plug valve, above which is inserted a steel funnel of 2-in. diameter neck, welded on. A line goes out of the bottom to the treater pump. Weighed amounts of litharge are added through the funnel; a 1-in. line brings in caustic solution to make up the doctor-treating solution, which is added to the gasoline through the treater-pump connection at a predetermined rate and proportion, to obtain the desired degree of sweetening. The assembly sits atop another 12-in. section of 10-in. pipe. A detail of the inside construction is a flat, horizontal plate above the bottom cone, to hold the litharge until dissolved, the plate being perforated with numerous 1/32-in. holes to allow the liquid to pass up or down as desired. A similar but not entirely identical arrangement is used to make up and feed sulfur solution continuously. *(Idea developed by treater P. L. Johnston, Skelly Oil Co., Longview, Tex.)*

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QUESTIONS on TECHNOLOGY

by W. L. Nelson
Consulting Engineer

Pressure Drop in Pipe Stills

What is the pressure drop through a pipe still? We see your answer of March 30, 1944, and would like to inquire if there are any cases worked out or published. We are interested in a topping still with 4-in. tubes operating on Mid-Continent crude oil. —R.F.M.

At the time of the question nothing had been published except the small amount of information given in American Petroleum Refining by Bell (2nd Ed., page 138, D. VanNostrand & Co., New York). Since that time computations have been made at University of Tulsa in regular classwork as shown here.

Fig. 1 shows the pressure drop and Fig. 2 the temperature gradient for one situation. Four sets of computations were made for vaporizations of 52½, 60, 67½ and 75 per cent. Note that the stills are not the same size. Many more computations are necessary before a generalized relationship can be stated. The still and conditions underlying Figs. 1 and 2 are:

Charge rate, bbl./day	2,000
Inside tube diameter, in.	3
Effective tube length, ft.	15
Equivalent tube length, ft.	30
Transfer line, ft.	70
(equivalent length), ft.	100
Inlet temperature, °F.	400
Mixed-base crude oil, A.P.I.	37
Tower pressure, psig.	6
Radiant absorption rate (on projected area), B.t.u.	25,000
Efficiency, per cent	77

Feed is at its boiling point.

This department was created for the purpose of aiding managers, superintendents, engineers, chemists and all those engaged in various phases of plant operation, as well as those connected with the marketing and utilization of petroleum products. Readers are invited to submit their problems to W. L. Nelson, technical editor. Inquiries must be signed, but only the initials will be printed.

For this particular still the pressure drop is a simple function of the average per cent vaporized (V) and the equivalent length (L)—

$$P = 44 + \frac{47}{10^6} V^2 L$$

Gross approximations for other stills might be made by modifying the pressure drop from the above equation by the ratio of the squares of the inside diameter but great care should be used in determining that other factors are not greatly different.

What is needed is several more sets of data similar to that on this page but for different boiling ranges of feedstock, different rates of heat input in both the radiant and convection sections and different back pressures. However, the trial-and-error computations required are extremely tedious and it will probably be years before comprehensive charts or information about pipe still pressure drops will be available.

Polytreating

What is the process of polytreating? —B.R.P.

This is a process suggested and studied by Haensel and Ipatieff of Universal Oil Products Co., Chicago. It has been described under the title, "Polytreating of Catalytically Cracked Gasolines" before the Atlantic City, April 1946, meeting of the American Chemical Society. It involves catalytic treatment with phosphoric acid catalyst. The process is practiced in the liquid phase at 400-800 psig. at 350°-550° F. and at space velocities of 0.5-1.0. It is practiced mainly on catalytically cracked fuels for the main purpose of polymerizing olefin hydrocarbons which tend to lower the lead susceptibility of the gasoline and thus permit higher octane numbers. The reactions that occur probably include (1) polymerization of olefins to higher olefins that boil mainly out of the gasoline boiling-range, (2) cyclization of higher olefins to naphthene rings, (3) dehydrogenation of naphthenes into aromatics, and (4) hydrogenation of olefins by the hydrogen produced during the aromatization mentioned in (3). The over-all results are (a) high yields of gasoline (70 per cent or more), (b) substantial decrease in olefin content, and (c) a stable low-sulfur product.

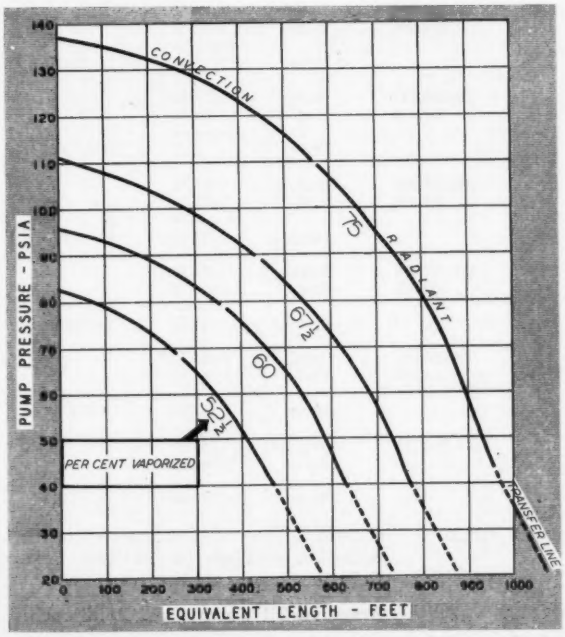


Fig. 1—Pressure drop in pipe stills—2,000 bbl. per day Mid-Continent crude oil—3-in. i.d. tubes. (See description)

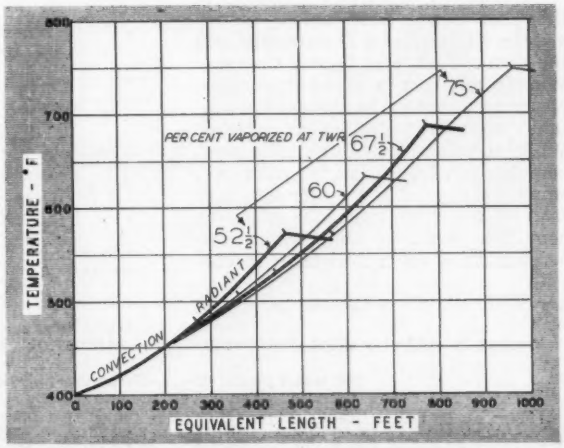


Fig. 2—Temperature curves in pipe stills—2,000 bbl. per day Mid-Continent crude oil—3-in. i.d. tubes. (See description)

East Texas Field Has Record of Outstanding Results from Its Four Year Program of

Salt-Water Disposal

by W. S. Morris*

PART 4 OF A SERIES

This is the fourth and concluding article dealing with the huge East Texas S. W. D. project, and completes the treatment of the many items of design, equipment, and operation that are involved. The other articles were (1) "How the World's Largest Brine-Injection Project Is Handled" (August 10), (2) "Engineering Factors and Operating Problems" (August 17), and (3) "Pressure Filters, Pits, Injection Wells, Other Equipment Items" (August 24).

At the time East Texas Salt Water Disposal Co. was organized, the stockholders consisted of 230 independent or smaller operators and 14 large companies. The organization of the company was projected on two bases: First, to dispose of salt water to relieve the contamination and pollution of the streams serving the East Texas area; and second, to maintain the bottom-hole pressure in the reservoir.

The Salt Water company started injecting water in the East Texas field on October 1, 1942. To determine the degree to which the purposes of the company has been accomplished, the 44-month record should be consulted. Table 1 shows the volume of salt water produced and the volume injected in the field during the period of the company's operations. During the first month of the company's operation, October 1942, the average salt-water production was 375,966 bbl. per day of which amount 87,007 bbl. per day were returned to the reservoir. The volume injected amounted to 23.14 per cent of the water produced. The precentage of water injected continued to increase, and for the year 1945 was 77.88 per cent of the total water produced. The percentage injected continued to increase further in 1946

There are several agencies interested in preventing the pollution and contamination of surface drainage in the East Texas field among which are the State Health Department and the Game, Fish, and Oyster Commission. In addition to these state agencies the operators in the field maintain an antipollution committee. While there are still some infrequent complaints of the loss of relatively small volumes of salt water into surface drainage, the field is in excellent condition as far as pollution is concerned; fresh-water fish have recently been caught from Striker Creek in the East Texas field for the first time since the field was developed. The antipollution agencies report that the salt-water problem is in better condition than at any time during their supervision. No injunction suits are now in course of prosecution against any operator in the East Texas field because of salt-water pollution. Thus it may be said with a certain degree of satisfaction that the pollution problem in the East Texas field has been practically solved.

*Vice president and general manager, East Texas Salt Water Disposal Co.

TABLE 1—SALT WATER PRODUCED AND INJECTED—EAST TEXAS FIELD

Year—	Salt water produced— Month (bbl.)	Salt water produced— Daily avg. (bbl.)	Salt water injected— Month (bbl.)	Salt water injected— Daily avg. (bbl.)	Injected (per cent)	Producing days per month
1942, 3 mos.	35,084,806	381,276	8,298,854	90,191	23.66	22
1943	145,503,540	398,640	73,642,841	201,761	50.61	21.5
1944	170,423,237	465,637	124,136,102	339,169	72.84	23
1945	176,152,000	482,608	137,179,479	375,834	77.88	23
1946, 6 mos.	86,816,000	479,646	75,046,005	414,619	86.44	22

TABLE 2—PRESSURE-OIL PRODUCTION RELATIONSHIP FOR EAST TEXAS FIELD

Year—	Oil production (bbl.)	Reservoir pressure (psi.)		Oil produced per pound pressure drop (bbl.)
1939:				
Total	141,423,317	Begin	1,106.78	
Daily	387,461	End	1,061.35	
		Drop	45.43	3,112,994
1940:				
Total	139,094,581	Begin	1,061.35	
Daily	380,040	End	1,051.73	
		Drop	9.62	14,458,890
1941:				
Total	130,407,594	Begin	1,051.73	
Daily	357,281	End	1,025.58	
		Drop	26.15	4,986,905
1942:				
Total	120,738,216	Begin	1,025.58	
Daily	330,790	End	1,015.71	
		Drop	9.87	12,232,840
1943:				
Total	128,568,647	Begin	1,015.71	
Daily	352,243	End	1,012.44	
		Drop	3.27	39,317,620
1944:				
Total	134,768,033	Begin	1,012.44	
Daily	368,219	End	1,001.24	
		Drop	11.20	12,032,859
1945:				
Total	131,021,969	Begin	1,001.24	
Daily	358,964	End	1,016.15	
		Increase	14.91	Increase
1946 (5 mos.):				
Total	52,026,700	Begin	1,016.15	
Daily	344,548	End	1,001.16	
		Drop	14.99	3,470,761
Grand total	2,222,572,210	Original	1,620.00	
Cumulative		6-1-46	1,001.16	
		Drop	618.84	3,591,513

Pressure-Oil Production Relationship

The degree to which the bottom-hole pressure in the East Texas field has been maintained may be observed

in Fig. 1 which is a graphic performance record of the East Texas field starting with 1931. The graph shows the reservoir pressure as recorded by the Railroad Commission of Texas and indicates a very definite flattening of the pressure-decline curve since the beginning of 1943.

The lower part of Fig. 1 shows the daily average oil production by months, the volume of salt water produced, and the volume of salt water returned to the reservoir for the same period.

The pressure-oil production relationship since 1939 is shown by years in Table 2. This tabulation shows the total oil production by years with the daily average by years; the reservoir pressure at the beginning and end of each year with the change; and the oil produced per pound pressure drop by years. Attention should be called to the pressure increase of 14.91 lb. during the year 1945 notwithstanding a daily average oil production of 358,964 bbl. per day. The pressure increase during 1945 was therefore more than sufficient to offset the 11.20 psi. drop during 1944 and the 3.27 psi. drop in 1943.

Significance of the pressure increase during 1945 may be better appreciated in the light of the statistical data of Fig. 1, which shows that although the total fluid produced averaged 936,993 bbl. per day during 1945, the volume of water returned to the reservoir in the amount of 375,834 bbl. per day reduced the net fluid withdrawals from the reservoir to 561,159 bbl. per day. It has been previously estimated[1] that the net fluid withdrawal from the East Texas field should not exceed 650,000 bbl. per day for efficient production.

The Salt Water company started the injection of salt water on October 1, 1942, at which time the reservoir pressure was 1,020.71 psi. On January 1, 1946, the pressure was 1,016.15 psi. which was a decline of only 4.56 psi. in 39 months. During that interval 427,124,650 bbl. of oil (daily average 359,835 bbl.) were produced. The oil production was at the rate of 93,667,680 bbl. for each pound decline in reservoir pressure.

For the first 5 months in 1946 the pressure decline has been 14.99 lb. However, 10.18 psi. of this decline was reported by the Railroad Commission during the month of May 1946 when the field was allowed to produce 26 days. Twenty-four producing days had been allowed for April 1946 whereas for 7 months previous to that time the producing days had not exceeded 21. For June and July 1946 the producing days have been limited to 21 and it is believed that the pressure will stabilize itself as a result of this schedule.

Water-Oil Ratio Order

To encourage further the disposal of salt water by its return to the Woodbine sand, the Railroad Commission issued its order No. 20-4195, effective January 10, 1943, to impose a water-oil ratio on production from the field. Operators have been familiar with gas-oil ratio limitations

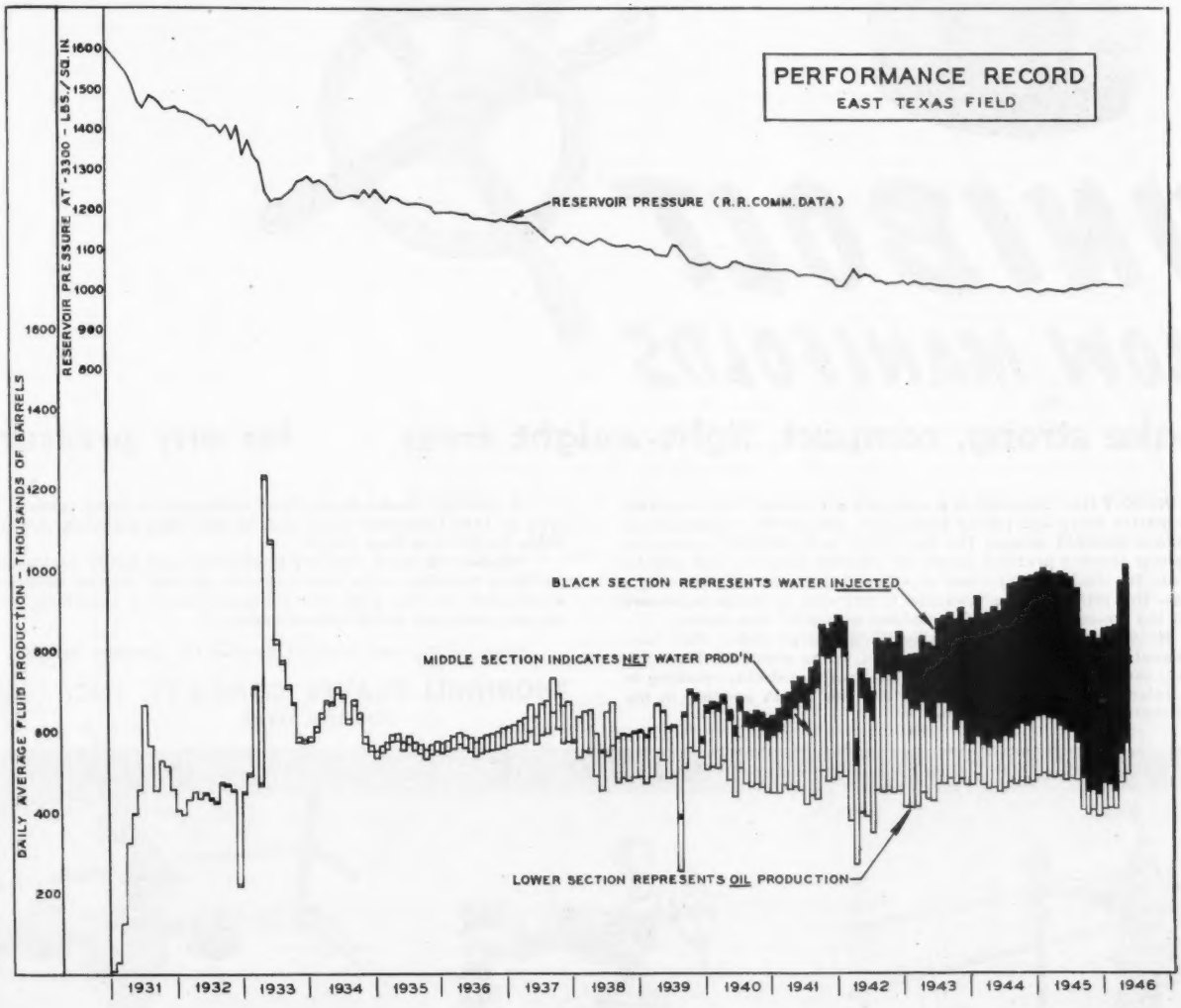
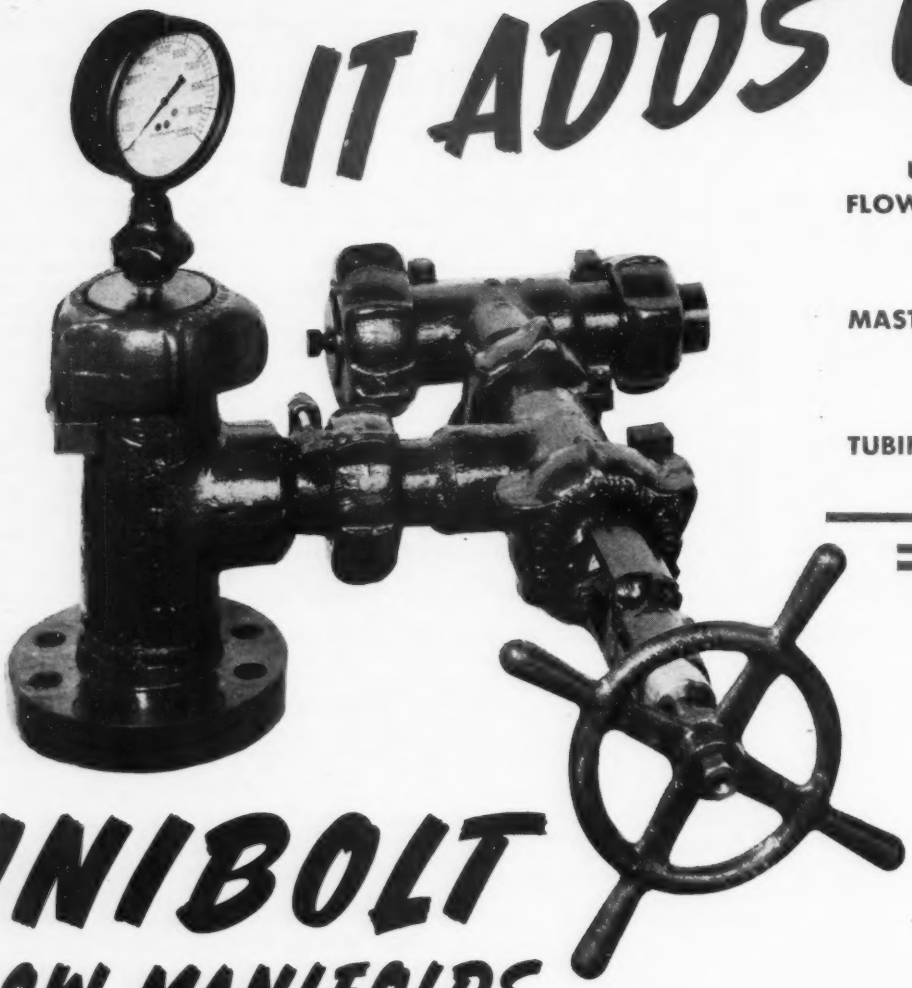


Fig. 1

IT ADDS UP



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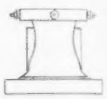

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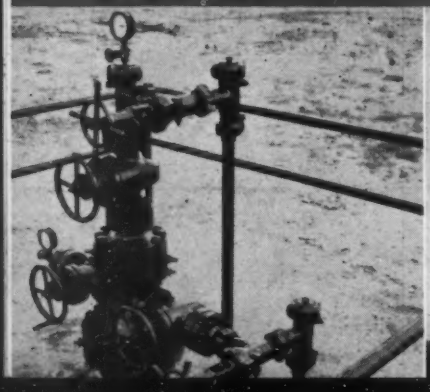

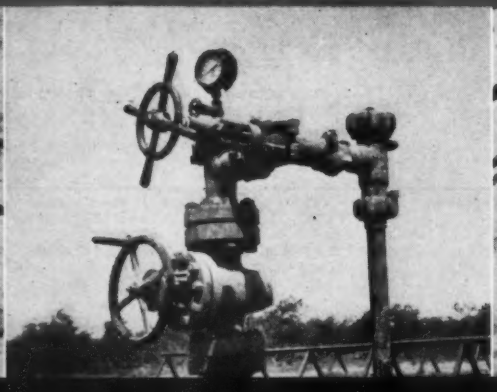

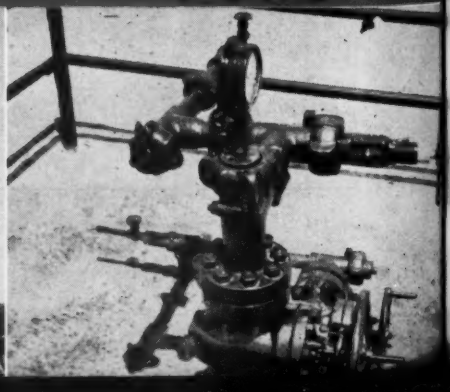

for a number of years, but a water-oil ratio order was of a revolutionary nature and was considered by many as a long step toward the conservation of reservoir energy.

The water-oil ratio order of the commission permitted a "10 to 1" ratio; that is, a well with an allowable of 20 bbl. was limited to a water production of 200 bbl. per day. Some opposition in the field developed to this order by operators with wells producing large volumes of water. However, the order provided for the water-oil-ratio to be determined only on water that was not returned to the Woodbine sand. In other words, if an oil operator returned all of the water produced from his wells to the reservoir through his own salt-water-injection facilities or those of the Salt Water company, he was not subjected to the penalty of a reduced oil allowable. Only those wells whose water production was not returned to the reservoir suffered a penalty under the water-oil-water ratio order.

Water-Oil Ratio Reduced

Later the Railroad Commission reduced the water-oil ratio to 5 bbl. of water for each barrel of oil. The change was made effective July 1, 1943, by the commission's order No. 20-4959. This further restriction on the volume of water produced made it almost necessary for an operator of a well producing any volume of salt water to return the water to the reservoir or suffer a severe reduction in the oil allowable. Where a large water-producing well was isolated and could not obtain salt-water-disposal facilities the Railroad Commission permitted, by another order, No. 20-5036, effective July 7, 1943, the shutting down of the large water-producing wells and the transfer of the allowable to other wells in the field. Before such a transfer was permitted, a special hearing was held by the Railroad Commission to consider each case on its merits. Before any well could be shut down and the allowable transferred, the well had to be tested to the satisfaction of the engineers of the Railroad Commission to determine its capacity to produce both oil and water; further the royalty owners on the lease to be shut down had to agree in writing to the plan and the royalty owners on the lease where the oil was to be produced likewise had to agree to the production of such oil. It was contemplated by the commission that in such cases double royalty would have to be paid unless special arrangements could be made by the operator.

In the orders of the Railroad Commission which permit the transfer of bonus oil granted by the commission for the return of water to the sand, from one lease to another, there is no provision requiring an agreement from the royalty owners. The additional allowable for the return of salt water to the reservoir is not an oil allowable granted by the commission because of the "production of salt water," but is an additional allowable granted to the operator to compensate for the return of the salt water to the reservoir. Therefore the royalty owners on the lease where the water is produced are not entitled to any participation in the bonus oil granted for the return of the water to the reservoir, unless of course the bonus oil is produced on the same lease where the salt water is produced. In other words the royalty owners are paid where the oil is produced, but no royalty is paid for the production of salt water.

References

1. Buckley, S. E., "The Pressure Production Relationship in the East Texas Field." A.P.I. Drilling and Production Practice, 1938.

America's Fuel Ace In the Hole

(Continued from page 68)

The reasons are simple. Shale oil is unneeded as long as ample supplies of natural petroleum are available; its extraction is more costly than that of petroleum; and the technology of mining, retorting, and refining American shales and shale oils has been largely unknown.

That picture, however, is changing. Recognizing the change, the Bureau of Mines is building a $500,000 oil-shale research and development laboratory on the campus of the University of Wyoming at Laramie. Here, near the shale beds, scientists already are at work studying the composition of oil shale, shale oil, and their products. Methods of processing and using these materials are being developed. At Anvil Points near Rifle, Colo., virtually in the heart of the oil-shale district, a $1,500,000 demonstration plant is being erected to apply the lessons learned in the laboratory, to determine the economic or cost factors involved, and to test for private industry the feasibility of various processes of producing oil from shale.

Wide Geographic Distribution

Oil shales have very wide geographic distribution, and deposits are found on all continents. The oil-shale reserves of the United States are estimated to contain 144 billion barrels of oil, of which 92 billion barrels are said to be recoverable—roughly four to five times the country's known recoverable supply of crude petroleum. Some 76 billion barrels, or more than 82 per cent of the recoverable total, is sealed in the Green River formation shales of three Rocky Mountain states. Western Colorado leads with some 48 billion barrels, northeastern Utah has 26 billion barrels, and southwestern Wyoming 2 billion. The second major deposit occurs in the New Albany formation of Indiana, Kentucky, and Ohio. Texas and Nevada have isolated oil-shale deposits of possible future commercial importance, and smaller beds have been found in at least 13 other states.

To guarantee the Navy oil or possible emergencies, large sections of the public domain were withdrawn long ago from areas upon which claims could be staked out by the public. In 1916, President Wilson designated 44,560 acres in Colorado as Naval Oil-Shale Reserve No. 1 and 91,464 acres in Utah as Reserve No. 2. Subsequently, in 1924, a third Naval shale reserve of 22,600 acres was established in Colorado for shale plant-site purposes and 4,880 acres were added to Reserve No. 2. The site selected for the Bureau of Mines demonstration plant is on the Naval reserves.

These oil-shale deposits of the Green River formation vary widely in oil yield and thickness in different localities and even within the same deposits. In Colorado, the richness ranges from barren shale yielding less than 5 gal. of oil a ton to thin beds assaying more than 70 gal. a ton. The shale beds attain a maximum thickness of about 2,600 ft. Utah's shale beds in the same formation average one-third to one-half the thickness and Wyoming's one-tenth the thickness of those in Colorado.

Nature of Oil Shale

Formed millions of years ago in the Eocene age, the beds of oil shale were laid down in lakes and lagoons having wide expanses of quiet, fresh, or semifresh water. They contain a large amount of organic matter—low forms of plant life like algae, together with pollen, spores, insects, and larvae. Much of the inorganic matter is structureless and apparently was derived from the partial putrefaction of aquatic micro-organisms that grew in the ancient lakes.

Oil shale is a fine-grained sedimentary rock with a laminar structure somewhat similar to slate. It may vary in color from gray, sandy, or brown to blue or almost black, and there is little outward appearance or feel of oiliness. Rich, thin pieces of shale can be ignited with a match, however, and will burn with a sooty flame and an odor similar to petroleum. When the shale is heated in a closed container—such as by destructive distillation or retorting—shale oil is formed from the organic material, or "kerogen." The kerogen content of oil shale varies greatly, depending upon the shale's source. Its chemical composition is not fixed and its structural formula is controversial. The inorganic material in oil shale is largely clay and limestone, but its composition also varies widely.

Sufficient quantities of petroleum

always have been available in the United States at a cost that made the extraction of oil from shale economically impractical, even though this country posesses an abundance of relatively high-yielding shale. Several small-scale commercial attempts have been made to establish oil-shale plants, but none of these was successful. A few ultimately reached the production stage and were discontinued when the process or equipment failed. Others, although operated successfully from the standpoint of processes and equipment, collapsed because of high production costs. Catlin Shale Products Co., established about 30 years ago near Elko, Nev., was perhaps the most noteworthy of these commercial attempts. The operations demonstrated that motor fuels and lubricants, competitive from the standpoint of quality with those produced at that time from other sources, could be made from the particular type of shale handled. Mechanical troubles and high production costs again intervened, however, and forced the company out of operation.

Early Promotion Schemes

Other factors also have retarded progress toward the utilization of American oil shales. One is a stigma remaining from the promotion schemes of a quarter century ago when many investors lost their money in stock companies formed to exploit the shale deposits of the Western states. Another is the improper approach toward solution of the many technical problems of shale-oil production. The established industrial procedure is to conduct research and pilot-plant studies until a foundation of knowledge is created on which to build before expanding to commercial or large-scale operations. This procedure was not followed by the early plant operators, and it is not surprising that they failed.

From 1925 to 1929, the Bureau of Mines operated an experimental oil-shale mine and retorting plant near Rulison, Colo., and a laboratory-scale refinery at Boulder, Colo. Before a shortage of funds halted the work, Bureau technologists mined and retorted approximately 6,000 tons of oil shale and produced 3,600 bbl. of oil. No commercial-scale production was attempted at that time, however, and the information obtained was inadequate to assess the technical and economic possibilities of shale-oil production by private enterprise in this country. That is the current objective.

A 200-ton-a-day experimental mine has been opened in the oil-shale cliffs, about 2,500 ft. above and overlooking the demonstration plant site near Rifle, and through selective mining, it will supply the retorts with shale from the various beds as desired while, at the same time, testing various mining methods and equipment. Although the mine and demonstration plant are only 1½ miles apart "as the crow flies," the truck-haulage road now being completed is more than 7 miles long and contains many switchbacks because of the variance in altitude.

A larger mine—actually an "underground quarry" designed to produce from 15,000 to 20,000 tons of shale daily—has been opened nearby to determine the best methods and unit costs of drilling, blasting, and loading oil shale on a commercial scale. Entries have been made large enough to drive trucks directly into the mine, and the oil shale will be loaded from benches with power shovels. As the oil yield from shale of probable future commercial importance ranges from 10 to about 65 gal. a ton, or approximately 4 to 25 per cent by weight, it is obvious that a relatively large weight of raw shale must be mined, transported, and treated to recover a barrel of oil. Thus, the mining and handling costs become important factors. Among the many problems which must be solved, those of drilling and blasting perhaps are the most important for oil shale is tough and resistant and can be drilled and broken only with difficulty. An agreement has been signed with Columbia University for the use of its barodynamic laboratory to determine the physical characteristics of the shale on Naval Oil Shale Reserve No. 1.

For exploring the reserve, three core-drill holes have been sunk at the mine site to determine the quantity and quality of the shale and plans are being made to drill in other areas to determine the extent of the reserve. Core samples are being analyzed at Laramie for oil yield and other characteristics.

Retorting

In the second phase of the project —retorting—heat is applied to the shale and the solid kerogen is converted to liquid oil. The conversion of kerogen is a chemical reaction, and in some respects resembles the "cracking" of petroleum. As the oil is formed, it passes off as vapors which subsequently are condensed. Of the many types of retorts, the Pumpherston, developed in Scotland nearly 50 years ago, is one of the most widely used. It was found unsatisfactory for Green River formation shales during the bureau's earlier experiments at Rulison because it became plugged after a short period of operation. Another type known as the N-T-U retort was found to be much more satisfactory, but the project was abandoned before the experimental work was completed. A contract was let early last October for the design, fabrication, and erection of two 40-ton-capacity N-T-U retorts for the initial retorting operations at the Rifle plant. These retorts are vertical, intermittent in operation, and internally fired. A down draft is provided by blowers and heat is generated by combustion of fixed carbon in the spent shale. Such hatch processes are objectionable in commercial operations, and it is not expected that the N-T-U retorts will prove commercially successful. However, they will serve for experimental work to obtain engineering and thermo-dynamic data and operating techniques, which will be useful in the development of improved processes and equipment. The retorts will be placed adjacent to a canyon that is 200 ft. deep and more than adequate for disposal of the spent shale.

Refining

Information available on oil-shale refining—the third phase of the project — is inadequate and must be brought up to date. Much of the technology of petroleum refining possibly may be applied to shale oil, but special methods and processes also must be developed. Shale oil as it comes from the retort is inferior to most petroleums in many respects. It is deficient in hydrogen, and, therefore, contains many unsaturated compounds which under certain conditions may produce polymers, tars, and gums. It also contains considerable quantities of objectionable sulfur and nitrogen compounds which are removed only with difficulty and high treating losses. Shale oil and its fractions are extremely malodorous and the products do not have stability in storage if left in an unrefined state. These problems will have to be solved. Therefore, it can be seen that the manufacture of marketable liquid fuels and petroleum substitute products from shale oil at economic prices will be complex and difficult. Because of the lack of refining knowledge, only a general program can be outlined now.

The tentative time schedule for the oil-shale phase of the synthetic-fuels program is based on an estimate that the first 2½ or 3 years will be required for opening the mines, constructing the experimental plant and refinery, and developing experimental operations. The remaining time from the 5-year program will be devoted to conversion from experimental to demonstration-plant operations.

In the 5 years allotted the bureau, there is much to be done. At Rifle, in the months since approval of the Anvil Points site, a physical plant is beginning to take shape. Buildings are rising from the mesa, cleared of cedar scrub and sage brush. The haulage adit of the experimental mine has been driven more than 700 ft. into the sheer face of the oil shale cliffs towering against the sky. Housing for the personnel; water, power, and telephone lines; and roads, shops, and administrative and laboratory build-

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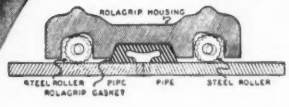

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ings for the mine and plant all are under construction and must be functioning before the processing equipment can be put in operation.

No program so large can be completed in 5 years. Research and development work never actually is completed. But by the summer of 1949, it is believed that the basic techniques of an oil-shale industry will have been demonstrated by the Bureau of Mines. Until then and until methods can be developed for their use, the vast oil-shale deposits of the United States which have been considered reserves for future needs are not reserves at all.

Hydroforming Process

(Continued from page 87)

in the boiling range of feed about 400° (up to perhaps 500°) does not give corresponding increase in the so-called polymer fraction, but only a portion of the additional high-boiling material shows up therein, the remainder presumably being cracked to a high yield of gasoline. This presumably indicates the possibility of conducting a high-yield cracking operation on nongasoline fractions as an adjunct to the octane improvement processing of straightrun gasolines.

The make-gas production from hydroforming is very rich in hydrogen, containing generally upward of 60 mol. per cent H_2, with a tendency for the hydrogen content to decrease with the more severe operations. Due to the high hydrogen content, the gas served very conveniently during the war as a source of hydrogen for the hydrogenation operations carried out on selective polymers.

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REVIEW OF PETROLEUM GEOLOGY IN 1945. Quarterly of the Colorado School of Mines, Golden. By F. M. Van Tuyl and W. S. Levings, with the cooperation of Ben H. Parker, C. A. Heiland, J. Harlan Johnson, A. W. Buell, and H. V. W. Donohoo. 203 pp. $2.

As in the preceding issues of this annual review, the subject is broadly treated to include developments in basic geologic sciences and such borderline fields as geophysics, geochemistry, and the interpretation of aerial photographs, in addition to the more restricted phases of geology as applied to the oil industry. The inclusion of a new section on world exploration and development is believed to be justified because of the growing interest in foreign reserves.

The Refiner's Notebook

A WEEKLY FEATURE OF THE OIL AND GAS JOURNAL

Viscosity by Various Instruments —Low Range

Kinematic viscosity,* centistokes	Universal Saybolt† in these temperatures			Saybolt Furol	Redwood Admiralty No. 2	Engler (degrees)	Redwood Standard No. 1
	100° F.	130° F.	210° F.				
1.5	....	....	....	....	....	(1.05)	
2.0	32.6	32.7	32.8	....	....	(1.09)	(30.0)
2.5	34.4	34.5	34.6	....	....	(1.13)	(31.0)
3.0	36.0	36.1	36.3	....	....	(1.16)	(32.0)
3.5	37.6	37.7	37.9	....	....	(1.20)	(33.0)
4.0	39.1	39.2	39.4	....	....	1.32	35.9
4.5	40.7	40.8	41.0	....	....	....	....
5.0	42.3	42.4	42.6	....	....	1.40	38.4
6.0	45.5	45.6	45.8	....	....	1.48	41.1
7.0	48.7	48.8	49.0	....	....	1.57	43.7
8.0	52.0	52.1	52.4	....	....	1.65	46.3
9.0	55.4	55.5	55.8	....	....	1.74	49.1
10.0	58.8	58.9	59.2	....	....	1.84	52.0
11.0	62.3	62.4	62.7	....	....	1.93	55.0
12.0	65.9	66.0	66.4	....	....	2.03	58.1
13.0	69.6	69.7	70.1	....	....	2.13	61.3
14.0	73.4	73.5	73.9	....	....	2.23	64.5
15.0	77.2	77.3	77.7	....	....	2.34	68.0
16.0	81.1	81.3	81.7	....	....	2.44	71.4
17.0	85.1	85.3	85.7	....	....	2.55	74.9
18.0	89.2	89.4	89.8	....	....	2.66	78.4
19.0	93.3	93.5	94.0	....	....	2.77	82.1
20.0	97.5	97.7	98.2	....	....	2.88	85.7
21.0	101.7	101.9	102.4	(15)	....	2.99	89.5
22.0	106.0	106.2	106.7	....	....	3.10	93.2
23.0	110.3	110.5	111.1	....	....	3.21	97.1
24.0	114.6	114.8	115.4	(16)	....	3.32	100.9
25.0	118.9	119.1	119.7	....	....	3.45	104.7
26.0	123.3	123.5	124.2	....	....	3.57	108.6
27.0	127.7	127.9	128.6	(17)	....	3.70	112.5
28.0	132.1	132.4	133.0	....	....	3.82	116.5
29.0	136.5	136.8	137.5	....	....	3.95	120.4
30.0	140.9	141.2	141.9	(18)	(13.9)	4.08	124.4
31.0	145.3	145.6	146.3	....	....	4.21	128.3
32.0	149.7	150.0	150.7	....	....	4.34	132.3
33.0	154.2	154.5	155.3	(19)	(15.1)	4.46	136.3
34.0	158.7	159.0	159.8	....	....	4.59	140.2
35.0	163.2	163.5	164.3	....	....	4.72	144.2
36.0	167.7	168.0	168.9	(20)	(16.2)	4.85	148.2
37.0	172.2	172.5	173.4	....	....	4.98	152.2
38.0	176.7	177.0	177.9	....	(16.9)	5.10	156.2
39.0	181.2	181.5	182.5	(21)	....	5.23	160.3
40.0	185.7	186.1	187.0	....	....	5.36	164.3

*Centipoises obtained by multiplying by specific gravity at same temperature. †A.S.T.M., D446. () Parenthesis means approximate.

No. 108 in a series by W. L. Nelson, professor of petroleum refinery engineering, University of Tulsa

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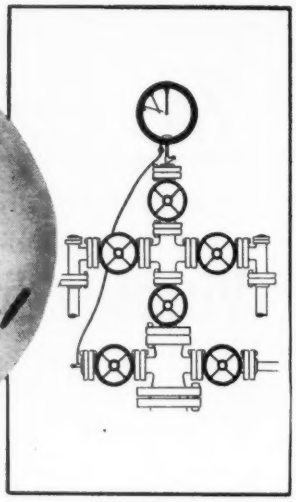

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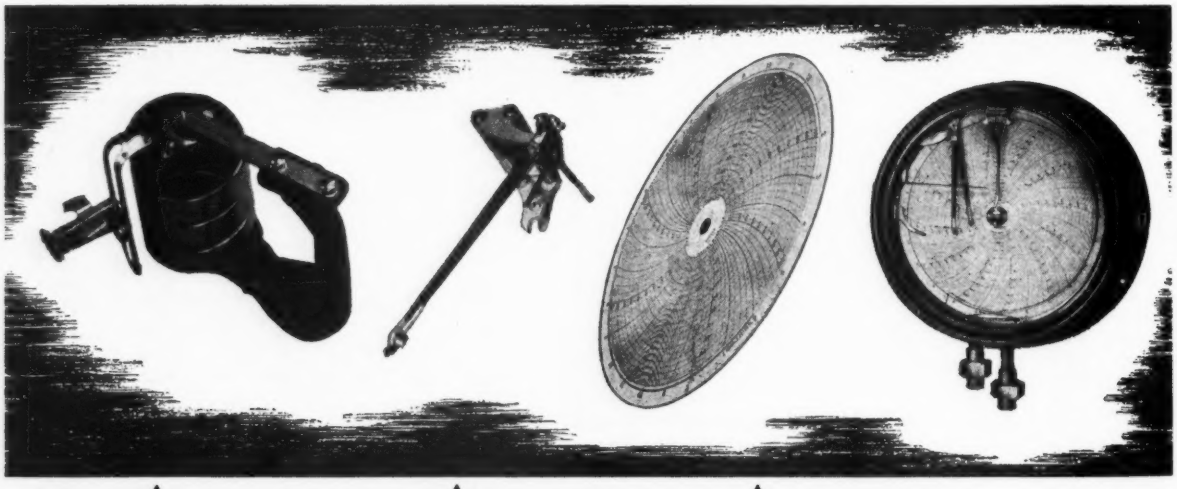

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INSTRUMENTS FOR OIL PRODUCTION

Principle of the Oil-Well Pump

This article begins a new subject, "Oil Well Pumping," which will be discussed in a number of installments in this series. The first takes up the very simplest type, the ordinary "pitcher" pump, to emphasize the role of pressure differentials.

ALL pumps depend for their operation upon the creation of a "pressure differential," which is merely an engineering expression that means a difference in pressure exists at some particular reference point. Without such a pressure differential no flow of fluid can take place, but as soon as a pressure differential has been produced a tendency is developed immediately for the fluid to move from the points of high pressure to those of lesser pressure.

One of the simplest pumps is the ordinary pitcher pump, which has long been used to lift water to the surface from cisterns and wells. As illustrated in Fig. 1, it consists of five essential parts: (1) a hollow cyclinder, C; (2) a close fitting plunger, G, which slides up and down in C; (3) an upper valve, V_u, placed inside of plunger G; (4) a rod, R, that connects the plunger G to a handle, H, which serves as a lever with its fulcrum at F; (5) a lower valve, V_b, located at the bottom of the cylinder. The valves are commonly made of thick leather or similar material, and each one has a small metal weight fastened to its upper side. In most instances the leather is also attached to one side of the valve housing so that it cannot move off center. A pipe, P, usually 1 to 2 in. in diameter, connects the pump to the reservoir, W, which may be a tank, cistern, or well, shown in Fig. 1, with water standing at the level S_w.

At the beginning of an operation, air fills all the spaces A, B, C, and D above the water surfaces S_p and S_w. The air is under the normal pressure of the atmosphere, which averages 14.7 psi. at sea level, but becomes less as the elevation above sea level increases. As illustrated, when the handle H is depressed, the rod R lifts plunger G and the upper valve V_u remains flat against its metal seat. Upward movement of the plunger increases the volume of space C between V_u and V_b and hence the contained air expands slightly to fill that space, which means that the pressure in C has been reduced. However, the pressure on the lower side of V_b is still 14.7 psi.; hence a pressure differential has been created between the upper and lower sides of V_b. The greater pressure on the under side of V_b raises the latter from its seat, and air then passes upward from B through the opening produced; this movement of air continues as long as the plunger is moving upward. Still further, the passage of some of the air from B into C has reduced the pressure in B against the top of the water which was standing at level S_p when the operation started, and thus another pressure differential has been created at that level between the water outside of the pipe P and that inside it. Water will therefore move into pipe P through any available openings such as O, or through the bottom of the pipe, and rise in pipe P until a balance has been restored between (a) the pressure exerted at S_p by the combined weight of the water column in P, plus the weight of the air above it in B and C, and (b) the normal pressure of the air on the surface of the water at S_w. As the motion of the handle of the pump is reversed and starts up again, the rod R and plunger G go down, and the air in chamber C is compressed, closing valve V_b and opening valve V_u because of the new pressure differentials created.

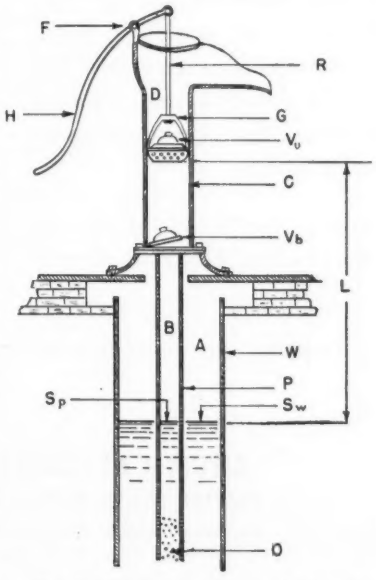

Fig. 1—Upward movement of plunger

Repetition of these steps or alternate movement of the handle of the pump down and up will finally exhaust all of the air from B and C, and water will take its place. Thereafter the pump will lift water, due to the pressure differentials created in the water on opposite sides of the valves and between S_p and S_w.

A question which immediately arises is, "How high can the water be lifted by this type of pump? Is there any limit to this height?"

Since the basic cause of the water movement is the pressure differential between the water at S_p and S_w, the movement should cease whenever the downward pressure in pipe P at S_p becomes equal to that of S_w. However, the latter is equal to the weight of a column of air 1 in. sq., which extends up as far as air goes, and which at sea level normally amounts to pressure of 14.7 psi. Hence the height of the water column which is produced in pipe P must also be limited to that which would exert a pressure at S_p of 14.7 psi., because at that value no pressure differential would exist between S_p and S_w, and therefore no water movement could take place.

The above discussion ignores the weight of the valves; the pressure differential must always be sufficient to lift the valves.

Since water weighs 62.4 lb. per cu. ft., the pressure exerted at the base of a cubic foot of water would be 62.4 lb. distributed over an area of 1 sq. ft. or 144 sq. in. If this pressure of 62.4 lb. should then be divided by 144 sq. in., the pressure exerted by a column of water 1 ft. high and 1 in. square is obtained, i.e., 62.4/144 = .434 psi. But the maximum pressure at S_w is 14.7 psi.; therefore the greatest height to which a column of water could be raised by the kind of pump previously described is 14.7/.434, or 33.9 ft., shown by the distance L, Fig. 1. Practically no pump is perfect in its operation, so that the maximum lift must be something less than 33.9 ft. Usually a lift of 15 to 18 ft.—i.e., L = 15 to 18 ft.—is the maximum attempted by simple pumps of this type. However, the lift of water above V_u is limited only by the strength of the materials of which rod R is constructed.

Series prepared by Dr. E. A. Stephenson, head of petroleum engineering school, University of Kansas

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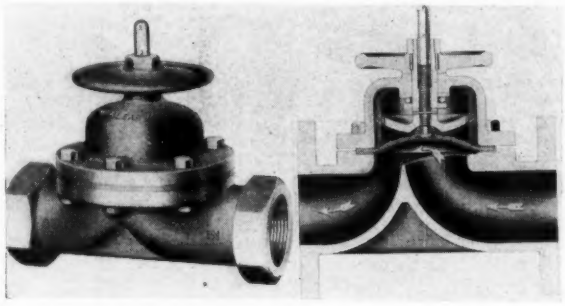

alkalies, abrasives, and suspended solids. Valve has no stuffing box and all moving parts are fully protected from fluids handled. With linings recommended for particular applications this valve is virtually indestructible. *McAlear Mfg. Co.*

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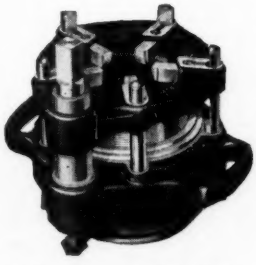
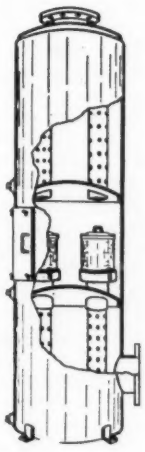


(2) NEW GEARED PIPE THREADER incorporates use of a quick-setting workholder and new balanced loop handles. These factors along with a twin-anchored drive shaft that turns in oilless bronze bearings are a few of the many features that revolutionize small pipe threading devices. No oil is needed for this threader. The gear is enclosed, packed tightly in a protected, greased housing from dirt and wear. *Ridge Tool Co.*

IT'S NEW CHECK IT



(3) COMBINATION AIR INTAKE CLEANER and snubber. Recommended for use on positive displacement blower and pump scavenged two-stroke cycle diesel and gas engines. Has large access opening for servicing filter elements. Uses light weight filter elements for long life and ease in handling. Has simplified construction that combines maximum cleaning and snubbing efficiency for better engine performance. *Burgess-Manning Co.*

IT'S NEW CHECK IT

(4) OIL, GREASE, AND WATER ABSORBENT produced from a unique alumina silicate material and capable of absorbing from 120 to 140 per cent of its own weight has recently been introduced to various industrial applicants by the producer. To be used on oily, wet, and greased floors, the absorbent eliminates danger of accidents due to slipping and at the same time keeping the floors clean and minimizing the chances of fire. *The Blue Mountain Clay Co.*

IT'S NEW CHECK IT

(5) NEW, IMPROVED PIPE-WIPER is designed to be more easily installed over the drill pipe for operation. Rubber contained in this new pipe-wiper is reputed to possess more than the ordinary amount of tear resisting qualities. The new wiper is also highly resistant to abrasion, oil, gas, heat, cold, and drilling mud chemicals. Greatest

The Oil and Gas Equipment Digest presents a review of what is new in equipment and trade literature . . . makes it possible for readers to obtain full information on every subject by use of convenient "Check It—Mail It" service card. This periodic feature of The Oil and Gas Journal will include all that is new in equipment . . . at a time when new products are being introduced, and existing products improved.

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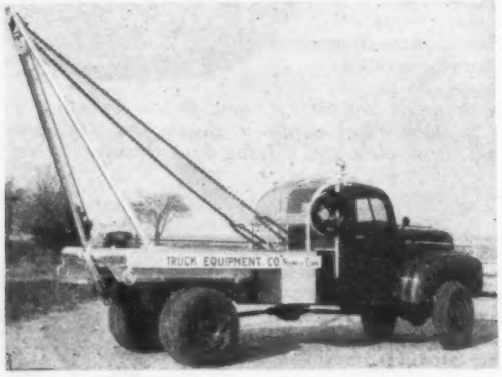
single advantage offered is the extra large surface of its wiping face. *The Duraflex Co.*

IT'S NEW CHECK IT

(6) REVERSE ACTING DIAPHRAGM MOTOR for control valves. New design enables reverse action without the use of a stuffing box. Other features include large diaphragm area, long stroke action, enclosed spring and an interchangeability of parts with the direct acting type "T" top. Also pilot diaphragm assembly of integrally mounted unit is interchangeable with the upper diaphragm casing of this new top work. Intended application of this diaphragm motor is for pneumatic operated control valves where a push down to close inner valve construction is desirable. *Fisher Governor Co.*

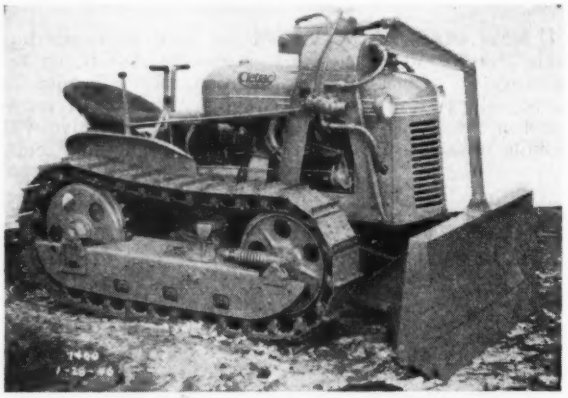
IT'S NEW CHECK IT

(7) NEWLY DESIGNED BODY FOR OIL-FIELD TRUCK incorporates many new features of safety and improvements on former designs. The headache rack gives positive protection to persons in the cab. Rack is also provided directly above the winch for carrying small tools and accessories. Spotlights mounted on top of headache posts are removable. Can be mounted on any conventional light truck that is normally used for this type of work. Comes complete with gin poles and all accessories. *Truck Equipment Co.*



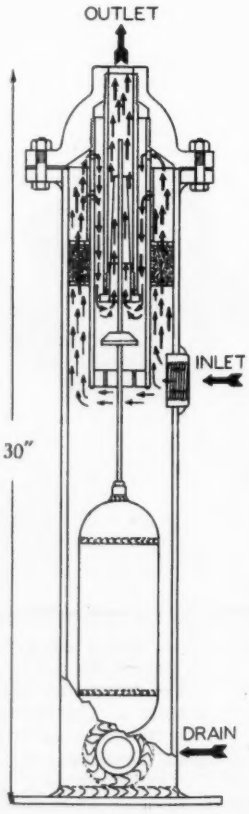
IT'S NEW CHECK IT

(8) SMALL HYDRAULIC BULLDOZER that possesses all the engineering features of the larger type bulldozers is now in production by the manufacturer. Named the "Imp," this new dozer is entirely front-mounted, leaving the rear of the tractor free for installation of other equipment. It is simple to install and easily transported from job to job. All thrusts are transmitted to the strong draw bar connections. *The Oliver Corp.*



IT'S NEW CHECK IT

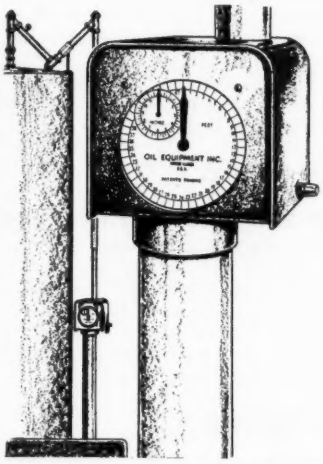
(9) REVOLUTIONARY GAS GUARD designed for a maximum of safety should be installed wherever gas is used from a field gas system. As shown in illustration, wet gas enters inlet and rises through bronze-wool filter to top of cylinder, where it strains through felt tube into downcomer pipe as dry gas. Dry gas then descends through downcomer, passes through valve and rises to outlet. Filters all mist, line scale, rust, and dust. Prevents all liquid from entering gas system lines. Protects compressors, heaters, and pumping units. Provides volume tank for gas engines, and safeguards lives and property. *H-Oil Engineering Corp.*



IT'S NEW CHECK IT

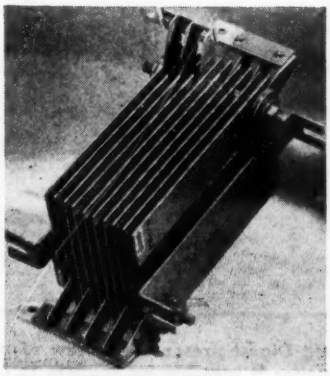
(10) NEW COMPACT VIBROMETER is an instrument of vest pocket size designed for accurately measuring vibration and comparing amplitudes. Its range is from 450 to 50,000 cycles per minute. Operating on the tuned reed principle, a steel reed is fed out from the body of the instrument and when the reed comes into tune with the machine vibrations, it will snap into a sharp vibration. Vibration frequency in cycles per minute is read directly from a graduated dial. *The Vibroscope Co.*

IT'S NEW CHECK IT



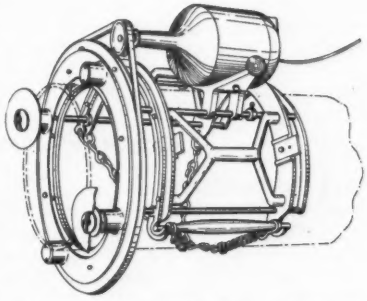
(11) NEW LIQUID LEVEL INDICATOR called the Econo-Gage by the manufacturer is designed for precision accuracy in measuring contents of all types of storage tanks, for gasoline, oils, chemicals, and other liquids. The gage has a minimum of working parts. By means of a specially designed float inside the tank and a counterweighted cable, the position or movement of the float or the rise and fall of the liquid being measured is transmitted to a grooved drum which in turn actuates the dial recording mechanism. The very slightest change in liquid level will be indicated with no chance of error. *Oil Equipment, Inc.*

IT'S NEW CHECK IT



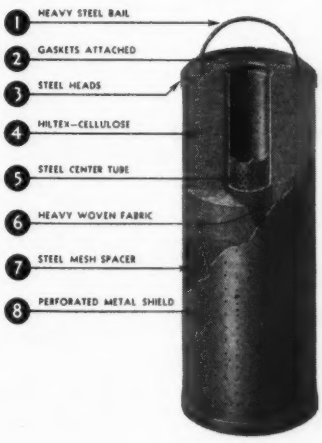
(12) PIPE-LINE CONTRACTORS and other line men will be interested in the new heavy-duty selenium rectifier stack designed for applications where power requirements are heavy. Main use of the item in pipelining will be cathodic protection afforded the pipe-line contractor. In the construction of the stack the advantages of parallel, series, or series-parallel connection permits the formation of whatever combination is needed to supply the desired load. *Federal Telephone and Radio Corp.*

IT'S NEW CHECK IT



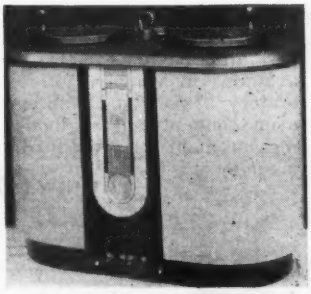
(13) NEW PIPE BUFFER for pipeline contractors. Designed to give workmen maximum service in polishing the bevel on plain end pipe in preparation for welding. The machine can be placed on pipe easily and quickly, and will clean the bevel on 24-in. pipe in 15 seconds. The grinder is constructed for durability, light weight, effectiveness, and economy. Electrically driven, it may be operated from electric welding machines on the line. *Wichita Tool Repair Co.*

IT'S NEW CHECK IT



(14) NEW TYPE FILTER CARTRIDGE made of specially processed cellulose offering uniform density and so packed as to eliminate the possibility of channeling. The filtering material used is suitable and has approval for filtering both the straightrun mineral oils and also the heavy-duty detergent type oils. *The Hilliard Corp.*

IT'S NEW CHECK IT



(15) NEW TWIN-UNIT OUT-DOOR A-C ARC WELDER in a single enclosure. Each of the two circuits in the welder can be used simultaneously and independently with electrodes up to 3/16 in. in diameter, or combined into one heavy duty circuit for welding with ⅜-in. electrodes. The units have a current range of from 90 to 270 amp. when used singly, and from 180 to 540 amp. when operated in parallel. Protection against all types of foul weather is provided by a weather sealed construction of all openings. *General Electric Co.*

IT'S NEW CHECK IT

TRADE LITERATURE

(16) NEW PUMP FOLDER containing several different catalogs and bulletins on various types of pumps. Included in this compact arrangement are pamphlets and bulletins on rotary, hand, and power pumps. Also an extensive list of all accessories. Folder also incorporates the use of future mailing service, as additional data will be mailed from time to time to be inserted with present material. *Blackmer Pump Co.*

IT'S NEW ✓ CHECK IT

(17) THE M-SCOPE is a new bulletin showing construction, prices, and usage of this buried pipe and cable locator. By the addition of various accessories, it becomes leak detector and box locator. Line drawings show the setup and various applications of this instrument. *Fisher Research Laboratory.*

IT'S NEW ✓ CHECK IT

(18) FACILITIES AND PRODUCTS is the title given to a new 70-page booklet just released by the manufacturer of alloy steels, alloy bars, and seamless tubing. The first section of the booklet illustrates the facilities used in carefully controlled production of the various steel products. The second section lists in detail the analyses, finishes, and sizes in which products made by the company are available. *The Timken Roller Bearing Co.*

IT'S NEW ✓ CHECK IT

(19) BALL-BEARING SWIVEL JOINTS for practically every industrial application are described and illustrated in the latest brochure released by the maker. In addition to the swivel joints, also listed are steel rotary hoses, all metal marine and barge hose, mud mixing guns, circulating heads, high pressure cementing and circulating hose, steam joints, and special joints. *Chiksan Co.*

IT'S NEW ✓ CHECK IT

(20) REFINERY TUBE CLEANING is covered in detail in a booklet published to describe a manufacturer's product designed for this work. Called the Lagonda type cleaner, it is described as having "full floating, antifriction power for refinery tube cleaning." *Elliott Co.*

IT'S NEW ✓ CHECK IT

(21) INDUSTRIAL TEMPERATURE GAGES of every model and design are described fully along with suggested applications in this new bulletin. These gages are available in a variety of ranges for industrial and laboratory uses. The advantages of these particular gages over conventional methods of industrial temperature measurement are outlined. *Weston Electrical Instrument Co.*

IT'S NEW ✓ CHECK IT

(22) NEW GAS LIFT CATALOG is offered to the industry. This new booklet presents data, formulae, and charts useful to all men interested in gas lift operation. Described with the aid of two-color schematic drawings. Cutaway drawings show important features of construction. Also includes many valuable tables and graphs for computing gas flow and choke diameters. *McEvoy Co.*

IT'S NEW ✓ CHECK IT

(23) BUILDERS FOR INDUSTRY introduces something new in the way of trade literature for the industry. This delightfully colored brochure is a 50-page booklet of educational as well as informative material. Published by a large engineering and construction firm, the booklet describes in detail the various types of work undertaken by this firm, both domestic and foreign. *Bechtel Brothers McCone Co.*

IT'S NEW ✓ CHECK IT

(24) WATERPROOF CONNECTORS for every type sub-marine application are described in a new multicolored brochure intended for distribution wherever electrical and other power connections are used. Connectors are also adaptable for use in geophysical exploration, barge drilling, swamps, lakes, rivers, under docks, with underground cable, or for use in any outdoor application where moisture conditions require a thoroughly sealed connection. *Cannon Electric Development Co.*

IT'S NEW ✓ CHECK IT

(25) PORTABLE POWER SAW AND POST HOLE DIGGER is described in new illustrated catalog. Saw can be operated by one man and clears out brush and trees in fraction of time required by old-fashioned hand methods. Catalog also shows how large saw blade can be set so as to cut wood in any desired length or to get at otherwise inaccessible tasks. Especially suited for pipe line projects. *Jaques Power Saw Co.*

IT'S NEW ✓ CHECK IT

(26) OILLESS BEARINGS are described in detail in a new bulletin published by the manufacturer. Bearings are made of hardwood, carefully tooled, and impregnated with a high-grade lubricating oil by a new exclusive process which provides automatic lubrication. *Nolu Oilless Bearing Co.*

IT'S NEW ✓ CHECK IT

(27) ALL TYPES OF OILFIELD equipment manufactured by a large southwest manufacturer are included with present prices in a new colorful 1946-47 catalog recently published. Index of items included describes and illustrates: adapters, anchors, blocks and hooks, drilling heads, kellys, flow valves, oil savers, packers, rope sockets, tubing swabs, spiders, strippers, and tubing catchers. *The Guiberson Corp.*

IT'S NEW ✓ CHECK IT

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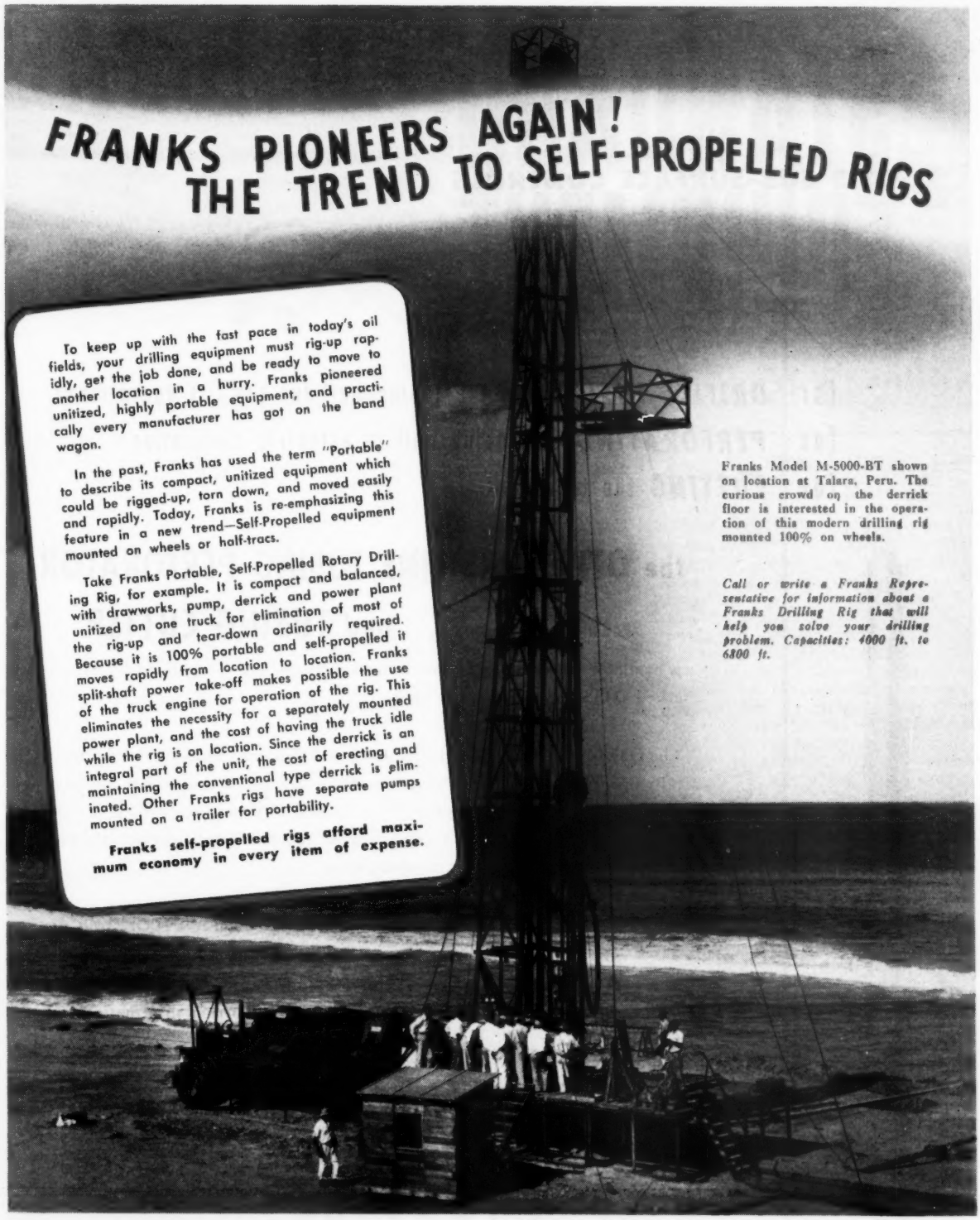

FRANKS PIONEERS AGAIN! THE TREND TO SELF-PROPELLED RIGS

To keep up with the fast pace in today's oil fields, your drilling equipment must rig-up rapidly, get the job done, and be ready to move to another location in a hurry. Franks pioneered unitized, highly portable equipment, and practically every manufacturer has got on the band wagon.

In the past, Franks has used the term "Portable" to describe its compact, unitized equipment which could be rigged-up, torn down, and moved easily and rapidly. Today, Franks is re-emphasizing this feature in a new trend—Self-Propelled equipment mounted on wheels or half-tracs.

Take Franks Portable, Self-Propelled Rotary Drilling Rig, for example. It is compact and balanced, with drawworks, pump, derrick and power plant unitized on one truck for elimination of most of the rig-up and tear-down ordinarily required. Because it is 100% portable and self-propelled it moves rapidly from location to location. Franks split-shaft power take-off makes possible the use of the truck engine for operation of the rig. This eliminates the necessity for a separately mounted power plant, and the cost of having the truck idle while the rig is on location. Since the derrick is an integral part of the unit, the cost of erecting and maintaining the conventional type derrick is eliminated. Other Franks rigs have separate pumps mounted on a trailer for portability.

Franks self-propelled rigs afford maximum economy in every item of expense.

Franks Model M-5000-BT shown on location at Talara, Peru. The curious crowd on the derrick floor is interested in the operation of this modern drilling rig mounted 100% on wheels.

Call or write a Franks Representative for information about a Franks Drilling Rig that will help you solve your drilling problem. Capacities: 4000 ft. to 6800 ft.

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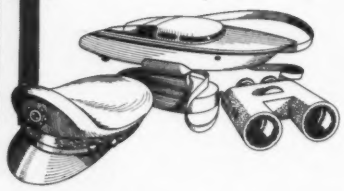
Export: A. V. Simonson, 149 Broadway, New York, N. Y.
California: Hillman-Kelley, Inc., 1000 Macy Street, Los Angeles
Illinois Basin: Stuart E. Corry, Box 51, Fairfield, Illinois
Texas, Louisiana, New Mexico, Arkansas, Mississippi: R. M. White, 823 Neil P. Anderson Bldg., Fort Worth Texas
Mississippi, Louisiana, Arkansas, Georgia, Alabama, Florida: L. R. Page, 3539 Hawthorne Drive, Jackson, Mississippi
Rocky Mountain: Industrial Power Units, Inc., Box 152, Casper, Wyo.

FRANKS MFG. CORP.
WELL SERVICING AND DRILLING UNITS
TULSA, OKLAHOMA

STANDARD EQUIPMENT

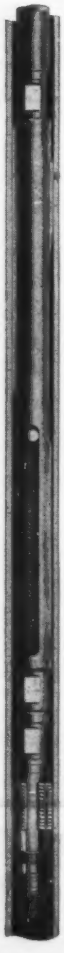
OTIS SUB-SURFACE CONTROLS



for ***ORIFICE INSERTS*** in the tubing wall for gas lift operations!

for ***PERFORATING*** the tubing wall to establish circulation!

for ***CUTTING*** the tubing!



the OTIS WIRE LINE TUBING PERFORATOR *and* TUBING CUTTER

is available for these and many other functions, and is operated by experienced OTIS wire line service crews.

The OTIS Wire Line Tubing Perforator and Tubing Cutter is run, mechanically operated, and pulled under pressure, on a steel measuring line. Installation of orifice inserts, perforating, or completely cutting the tubing in two, usually takes only a few hours, and does not require either a derrick, A-mast, drilling mud, pulling unit, or tubing crew.

No explosives are used. Procedure is *SIMPLE — SAFE — ECONOMICAL.*

The OTIS Wire Line Tubing Perforator and Tubing Cutter is not sold within the continental limits of the United States. Further information furnished on request.

OTIS

T. M. Reg.

OTIS PRESSURE CONTROL, INC.

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OTIS ENGINEERING CORPORATION—MANUFACTURE AND DEVELOPMENT
DISTRIBUTORS. OTIS PRESSURE CONTROL, INC., DALLAS, TEX.; OTIS EASTERN SERVICE, INC., BRADFORD, PA.; WESTERN PRESSURE CONTROL, LOS ANGELES, CALIF.

NATURAL GAS

California Reserves Set At 11,421 Billion Cu. Ft.

SAN FRANCISCO.—Total natural-gas reserves of California as of January 1 have been placed at 11,421,450,939,000 cu. ft. by the California Railroad Commission and the Oil and Gas Division of the State Department of Natural Resources.

According to a special study resulting from the work of the Railroad Commission in cooperation with the Oil and Gas Division nearly 7,000,000,000,000 cu. ft. of the total is oil-well gas, and 4,500,000,000,000 cu. ft. is dry gas. Gas in underground storage at La Goleta and Playa del Rey is estimated at about 50,000,000,000 cu. ft.

In testimony before the Federal Power Commission several weeks ago, E. DeGolyer, well-known geologist, set California's reserves as of January 1 at 12,555,435,000,000 cu. ft.—8.70 per cent of the nation's total.

Another California report, prepared under the supervision of Roy A. Wehe, assistant director of the public utilities department of the commission, lists total utilization of natural gas in California in 1945 at slightly more than 538,000,000,000 cu. ft.

Arrangements Complete for Pacific Coast Gas Meeting

LOS ANGELES.—Arrangements are complete for annual meeting of the Pacific Coast Gas Association in San Francisco September 10-12. Special interest of the natural-gas industry is focused on papers by Arthur F. Bridges, vice president, Southern California Gas Co., and Roy A. Wehe, California Railroad Commission. Bridges will discusse design and economic aspects of the 30-in. line from Blythe, Calif., to the San Diego-Los Angeles areas. Wehe will summarize data on natural gas reserves in California.

Another feature of the meeting will be installation of new officers, headed by LeRoy M. Edwards, vice president and general manager of the Pacific Lighting Corp., who will take office as president of the Pacific Coast association October 1. A. H. Sutton, president, Mission Appliance Corp., will become vice president of the association. New directors include C. H. Gueffroy, vice president, Portland Gas & Coke Co., and J. S. Moulton, executive engineer, Pacific Gas & Electric Co.

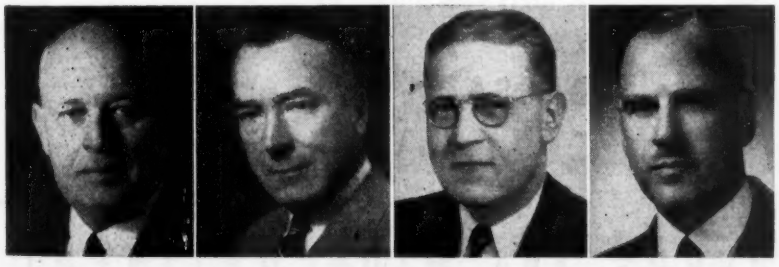
Compact Seeking Adoption Of Uniform Pressure Base

OKLAHOMA CITY.—The Interstate Oil Compact Commission is launching a program for adoption of a uniform pressure base of 14.65 psi. (4 ounces above assumed atmospheric pressure of 14.4 psi.) in reporting natural-gas production to state conservation departments. The method was recommended to all gas producing states by the commission's research and coordinating committee in a report submitted at the recent Grand Rapids, Mich., meeting.

Use by all states of the uniform pressure base in reports and statistics on gas production was urged by the committee in an effort to put figures from the various states on a comparable basis. Prior to submission of its report, the committee, of which Walker T. Pound, Oklahoma conservation officer, is chairman, made an analysis of pressure bases in all states.

The commission adopted the report of the research coordinating committee, which now will go to the conservation departments of each state, most of which are represented on the committee, with recommendation that the uniform base be established by appropriate rule or regulation.

The recommended base of 14.65 psi. is required by statute in Texas and Arkansas. Laws in other gas-producing states do not specify the base, and as a consequence the figure set by rule or regulation in the various states varies widely. Since Texas and Arkansas are the only states having pressure base fixed by law, the committee felt that all other states should conform to the base required in those two states. The pressure base established by state conservation and tax departments for computation of deliveries for tax and record purposes often is not the same as specified in the oil and gas lease or contract.



LEROY M. EDWARDS *A. H. SUTTON* *C. H. GUEFFROY* *J. S. MOULTON*

Natural Gasoline

Program Completed for C. N. G. A.'s Fall Meeting

LOS ANGELES.—Program arrangements for the 1946 California Natural Gasoline Association fall meeting, Ambassador Hotel, Los Angeles, October 11, have been completed. Ed Ragatz, Bechtel Bros. McCone Co., heads the program committee.

Opening the morning session, Dr. B. H. Sage, California Institute of Technology, will present data and methods which natural-gasoline plant designers and process engineers can use to predict accurately thermodynamic properties of hydrocarbons. Then C. D. Gard and Hugh Colvin, Union Oil Co. of California, will discuss the economics of LPG operations from the manufacturer's viewpoint. The final paper of the morning session will evaluate the various methods available for processing absorption-plant rich oil.

In the afternoon, following the address of M. W. Kibre, association president, Frank West of the engineering firm of West & Cole, will discuss selection of absorption pressures for plants in high-pressure fields. In the second paper, R. C. Alden, Phillips Petroleum Co., will discuss natural-gas conversion by the Fischer-Tropsch process. The final paper of the meeting will be presented by Ragatz and will deal with the determination of absorber operating efficiencies. The evening session will be in charge of C.N.G.A. entertainment chairman, Phil Mettling, Cooper-Bessemer Corp.

Rangely Plant Studied

DENVER.—A survey looking to the construction of a natural-gasoline plant is being conducted in the Rangely, Colo., field for an unnamed company, it was disclosed here recently. Officials of Stearns-Roger Manufacturing Co. said the survey will take some time to complete.

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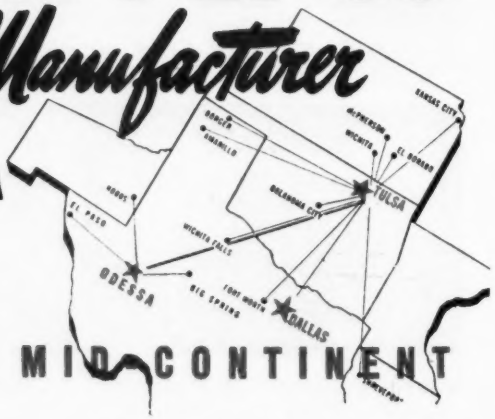

Service That COVERS The MID-CONTINENT

REFINING

Two Refineries Planned To Use Alberta Crude

LLOYDMINSTER, Alta. — Two projects for utilizing heavy crudes from Wainwright, Vermilion, and Lloydminster fields, the two former in Alberta and the latter extending into Saskatchewan, are under consideration.

Luboil Refiners, Ltd., of Regina, Saskatchewan, are planning erection of a $300,000 plant to produce lubricants from Lloydminster crude. The plant will be designed to handle 1,000 bbl. daily, and to distribute in the Canadian West, with a paying price of $1.50 per barrel for production. Officials of the company have conferred with both the Saskatchewan and Alberta provincial governments.

Husky Refining Co. of Cody, Wyo., has engineers in the Lloydminster field completing arrangements for erection of an asphalt plant. The plant will process the Alberta heavy crudes to produce road materials, roofing material, briquette binders, and asphalt shingles. The company is making tentative contracts for the output of existing wells at $1.20 per barrel, and is planning to drill 10 wells in the Lloydminster field to supplant their production. The plant will be erected in Alberta, at some undetermined point in the Lloydminster-Vermilion-Wainwright area.

Fuel-Purifying Plant For Ships Developed

LONDON.—A fuel-purifying plant for ships, which will allow use of impure, low-grade crude in diesel engines, was announced last week by Anglo-Saxon Oil Co.

John Lamb, the inventor, who is head of the company's technical division, said the purifier costs about $8,000 and estimated it will save about $190,000 a year for a 10,000-ton vessel operating 300 days a year.

Official Data Released on Alberta Tar-Sand Work

EDMONTON, Alta.—Official information released as to operations sponsored by the Dominion Government in the tar-sand areas of northern Alberta up to March 31, 1945, show that exploratory drilling to define the tar-sand deposits was started in 1944 in the Horse River reserve near McMurray.

In 1944, 14 holes, totaling 1,481 ft., were drilled, and in 1944-45, 34 holes totaling 6,611 ft. A substantial amount of good-grade bituminous sand was proved. The equipment was then moved to Steepbank River, 20 miles north of McMurray, to determine the

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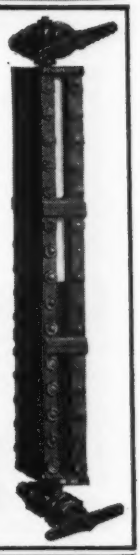
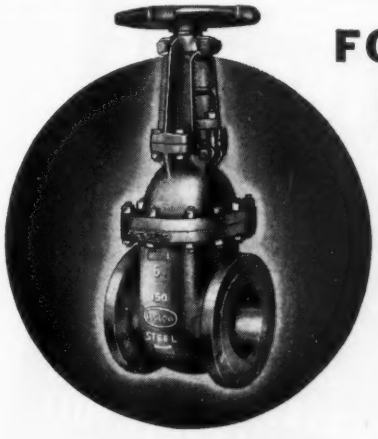
"TRANSPARENT"
DROP FORGED STEEL
LIQUID LEVEL GAGES

Used to observe color and density of liquids under high pressures and/or temperatures. Construction exceptionally sturdy. Made of alloy temperature resisting steel, and are highest quality throughout. Liquid chamber made from solid block of steel to assure perfect alignment and rigidity. Conform with A.P.I.—A.S.M.E. requirements.

The "Transparent" is one of the complete line of Penberthy gages that meet every liquid level gage requirement.



PENBERTHY INJECTOR CO.
DETROIT, MICH. Canadian Plant WINDSOR, ONTARIO



Ludlow Fig. 1581, Flanged Wedge Gate Valve with OS&Y. Cast Steel exceeds minimum requirements of A.S.T.M. Maximum temperature 750° F. Tested at 350 lbs. Also available with butt welding or screwed ends.

FOR A POSITIVE SEAL

—you'll want to use Ludlow Cast Steel Wedge Gate Valves. In applications of steam, water, gas and oil, the Ludlow Wedge-Gate principle exerts an evenly balanced pressure that positively seals both seats. Furnished with various trim materials, resists attack from corrosive fluids. Specifications and prices are yours for the asking.

V-12

The LUDLOW VALVE SINCE 1866
MFG·CO·INC·TROY·N·Y·

OIL and GAS BURNING EQUIPMENT

NATIONAL AIROIL BURNERS

1236 E. Sedgley Ave.
PHILADELPHIA 34, PENNA.

possible southerly deposits indicated by drilling in 1943. Here 14 holes indicated that deposition had taken place under disturbed conditions, and no additional tonnage of good-grade sand was indicated. In January 1945, a new program of closely spaced wells in the area covered in 1943 was started, 19 holes totaling 3,571 ft. being drilled. Results are not indicated.

Operation of Abasand Oils, Ltd., as a war project was undertaken in 1943 at the request of the Federal Oil Controller. The separation plant was put in operation in June, 1944, and available tankage was filled with bitumen by the time the refinery was ready to operate in December. Though experiments were interrupted by fire, operating data was made available "indicating the nature of the extraction and other problems requiring solution if steady year-round operation of a plant that would turn out commercial products is to be achieved."

Ashland's New Pilot Plant Will Test Crude Types

ASHLAND, Ky. — In announcing the completion of a new pilot plant at its No. 1 refinery, Ashland Oil & Refining Co.'s Arnold Leas, technical service supervisor, said the purpose of the unit was to carry on constant research and evaluation of crude oils which will lead to continued improvement of its products.

"Using the pilot plant data to select the exact type of crude desired for producing products to meet certain specifications provides close control over refining processes and the resulting products," Arnold said. Location of Ashland's refinery is such that it can receive economically, by water transport, various types of crudes from many states. Properties of these crude oils can be quickly analyzed and full-scale refinery operation data obtained which will show the expected yields and character of the various refined products.

In addition to evaluating crude, the pilot plant will provide information to improve operating procedures at the refinery in helping increase the efficiency of the crude-topping units, fractionating towers, and vacuum columns.

With a few additions to the pilot-plant equipment, investigations also will be made into methods of crude desalting, propane deasphalting, stabilizing, and preparation of special products.

Ashland's technical service department, which designed and supervised construction of the pilot plant, was established during the war to assist the company in meeting requirements for high-octane aviation fuel and has since had its responsibilities expanded to include all refinery process and research problems. With the first successful test run made in July, the company expects the unit to be in almost constant service.

Sohio Plans New Lube Unit at Toledo Refinery

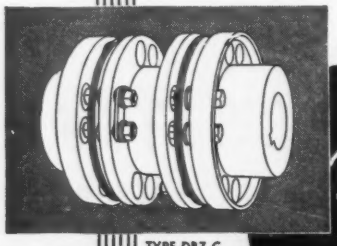
TOLEDO, Ohio.—Another unit in Sohio Petroleum Co.'s postwar expansion program was made known last week when G. W. Hanneken, vice president in charge of manufacturing, said that plans are nearly completed for the construction of a new $8,000,000 lubricating oil plant at Toledo. The new unit will be an addition to the company's present refinery, joining it at the Otter Creek Road and the East Bay shore. The company is now working on an oil-separation unit costing about $1,000,000.

According to Sohio officials, the new lube plant will be one of the largest in the country. Construction is expected to start early in 1947, contingent on Civilian Production Administration approval and delivery of materials.

Grease Laboratory Opened

Southwest Grease & Oil Co. has opened a new lubricating grease research and control laboratory at its plant in Wichita, Kans.

THOMAS
Flexible COUPLINGS
FOR HOT OIL PUMP DRIVES or any other service where 100% dependability is demanded



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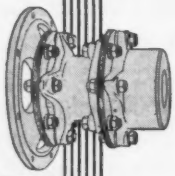

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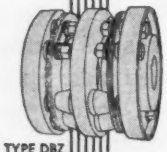


TYPE DBZ

THOMAS Flexible COUPLINGS provide for Angular and Parallel Misalignment as well as Free End Float . . . and Eliminate BACKLASH, FRICTION, WEAR and CROSS-PULL
NO LUBRICATION IS REQUIRED!

The Thomas All-Metal Coupling does not depend on springs, gears, rubber or grids to drive. All power is transmitted by direct pull.

Write for Complete Engineering Catalog!

THOMAS FLEXIBLE COUPLING CO.
WARREN, PENNSYLVANIA

PIPE LINES

Interindustry Committee To Combat Soil Corrosion

Plans to form an interindustry committee to improve procedures for handling problems arising from cathodic protection of pipe lines, communications cables, railroad signal systems, and other buried structures resulted from a recent meeting in St. Louis of representatives of seven interested industry associations and companies.

Those represented at the meeting were: American Association of Railroads; American Gas Association; American Petroleum Institute; American Water Works Association; Bell System; Western Union Telegraph Co., and the National Association of Corrosion Engineers. The American Transit Association was represented by an observer. Invitations to other interested industry associations are proposed. The meeting was initiated by the pipe-line group of the American Petroleum Institute. H. H. Anderson, vice president of Shell Pipe Line Corp., Houston, was elected chairman of the committee.

Working under the title, Correlating Committee on Cathodic Protection, the group proposes to undertake a program of education and assistance to be accomplished through the preparation of general and technical bulletins. These bulletins may be published and distributed on an industry basis. Provisional bulletin titles are: General Information on Cathodic Protection; Notification Procedure; Cathodic Protection Practices; and Joint Cathodic Protection Installations.

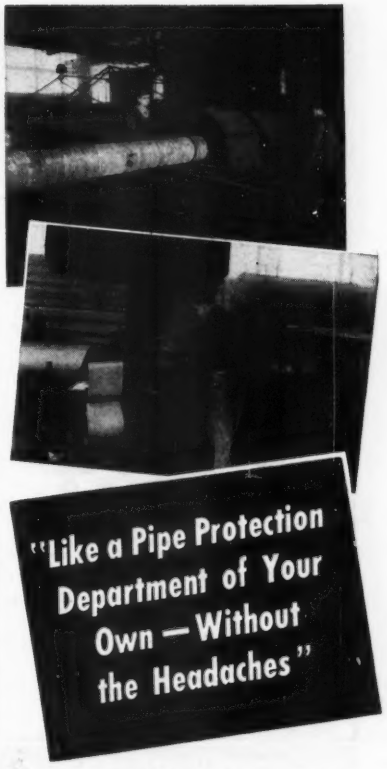
The program contemplates the geographical listing of all operators of buried structures in such a form as to assist any operator (intending to install cathodic protection) in his need to notify operators of crossed or adjacent structures that may be affected by such installation. Primarily, however, the program aims to stress the importance and frequent necessity of cooperation between managements as well as corrosion engineers in dealing with cathodic protection problems.

The proposed technical bulletins will contain examples of present recognized good practice, and are expected to serve to inform the uninitiated as well as to expedite the local solution of interline problems of interference prevention and cooperative protection. The Correlating Committee proposes to work in harmony with existing Metropolitan Electrolysis Committees whose present effective work on cathodic protection problems was recognized and commended at the St. Louis meeting.

Stress Corrosion Checked By Institute's Research

Methods of controlling a type of corrosion known as stress rust, which affects metals under strain and costs the pipe-line and other industries millions of dollars annually, are reported by scientists at the Illinois Institute of Technology it was disclosed last week.

Stress corrosion, a form of internal rust, affects tanks and boilers as well as pipe lines and occurs wherever metals in a condition of high stress come in contact with concentrated solutions. Among the methods developed and reported to be effective in combating this type of corrosion is a chemical solution derived



When you give Pipe Line Service a job of coating and wrapping pipe, you have the close cooperation that you'd expect only from a department of your own, without any of the headaches of equipment and personnel.

These experienced pipe protection specialists offer you a complete service at six strategically located plants that relieves you of all responsibility. You simply select the specification you want and Pipe Line Service does the rest.

Find out today how much *more* Pipe Line Service gives you for your pipe protection dollar.

COMPLETE SERVICE
Through Strategically Located Plants

- Coating and Wrapping
  At the Mill
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  Over the Ditch
- Pipe Cleaning Service
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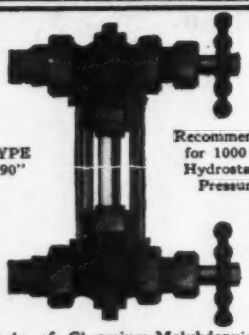
PIPE LINE SERVICE CORPORATION
PIONEERS IN STEEL PIPE PROTECTION
General Offices and Plant • FRANKLIN PARK, ILL.
Plants at Glenwillard, Pa. • Longview, Texas
Corpus Christi, Texas • Harvey, Louisiana

PENBERTHY
DROP FORGED STEEL
LIQUID LEVEL GAGES

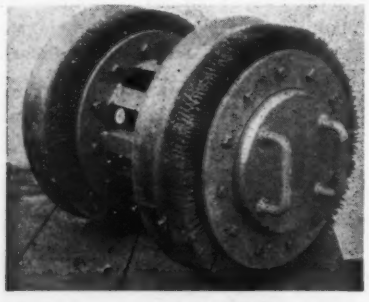


Made of Chromium-Molybdenuin alloy temperature resisting steel, extra heavy throughout and stainless steel trimmed. Positive automatic shut-off; stainless steel balls shut off the flow of liquid if glass breaks. Regrinding removable seats, heavy duty stuffing boxes, union connections. Conform with A.P.I.—A.S.M.E. requirements.

This is one of the complete line of Penberthy gages that meet every liquid level gage requirement.

PENBERTHY INJECTOR CO.
DETROIT, MICH. Canadian Plant WINDSOR, ONTARIO

WRITE FOR LATEST INFORMATION
Improved LCN Pig
Assures Maximum Gas Thru-put



Type LCN Pipe Line Pig

- For internal cleaning of natural gas transmission lines.
- Sizes 16 to 26-inch, inclusive.
- Rugged, light-weight steel construction.
- High velocity gas, jetting through enlarged by-pass, sweeps debris ahead of Pig.
- Tough rubber scraper cups and tempered steel wire brushes scour pipe walls thoroughly.

Types RC and SCN Pigs available for cleaning gas lines smaller than 16-inch.

THE PIG WITH THE POKE
CLEANS PIPE LINES
T. D. WILLIAMSON, Inc.
TULSA, OKLAHOMA

from coal tar. This organic inhibitor is claimed to be able to stop cracking even after it has started.

Other methods perfected at the institute include the application of high-temperature hydrogen to steel after it has been fabricated. This removes the nitrogen from the surface of the metal. Rated as one of the important discoveries of the institute, it was said that the presence of nitrogen in metal stimulated corrosion, a hitherto unsuspected factor.

Dr. Hugh J. McDonald, head of the corrosion research laboratory at the institute, estimated corrosion costs pipe-line companies $50,000,000 annually. He said that until recent years, various types of general corrosion were of principal concern to industry but as methods became available for solving these problems, stress corrosion came to the fore as a major industrial hazard.

Morrison Brothers Get T.G.&T. Spread Contract

HOUSTON.—Tennessee Gas & Transmission Co. announced last week that Morrison Brothers Construction Co., Odessa, Tex., has been awarded the contract for construction of 20 to 30 miles of 26-in. loop on its natural-gas pipe line.

Work on the job, part of Tennessee's $29,500,000 expansion program, is due to begin in September. The construction will be in the states of Louisiana and Arkansas. This is the first spread to be let on 410 miles of 26-in. loop.

Tests on Humble's New Line Near Completion

HOUSTON.—Tests on Humble Oil & Refining Co.'s new $4,000,000 gasoline pipe line between Baytown, Tex., and Fort Worth are expected to be completed some time this week, and if proved satisfactory, runs will be started immediately.

The 8-in. line, 276 miles long, has a capacity of about 15,000 bbl. of gasoline daily. Delivery terminals will be at Houston, Hearne, Waco, and Dallas.

Bechtel Brothers McCone Take Over Coating Work

SAN FRANCISCO.—Taking over of all Somastic pipe coating operations in the 11 western states and in all foreign countries by Bechtel Brothers McCone Co. of San Francisco and Los Angeles was announced last week by W. E. Waste, president.

As exclusive source for Somastic in this large area, the company is prepared to provide coated pipe in all sizes, to coat pipe provided by others, or to undertake the laying of Somastic coated pipe lines. Somastic was previously handled by Industrial Engineering Co. which has now become merged with H. C. Price Co., exclusive agents for Somastic in 37 eastern states.

Somastic plants are maintained by Bechtel Brothers McCone in the Los Angeles and San Francisco areas, while railhead and portable Somastic coating plant are dispatched as needed to job sites throughout the West and around the world.

Reconditioning Under Way

Bishop & Lock Construction Co., Dallas, is doing pipe reconditioning of 8-in. and 10-in. loaded lines between Normangee, Tex., and Richards, Tex., for Magnolia Pipe Line Co. The company is using a new type hammer cleaning machine. Operations are now under way at Iola, Tex.

Contractors Open Office

McVean & Roberts, Odessa, Tex., contractors, have established temporary headquarters office in Cresco, Iowa, during construction of a spread on Stanolind Pipe Line Co.'s products line extending from a point in Mower County, Minnesota, to a point in Dubuque County, Iowa.

BUCKEYE MAINLINERS
for faster digging of trenches for crude lines. Digs trench 24" to 39" wide — up to 8½' deep.

BUCKEYE TRACTION DITCHER COMPANY
Findlay, Ohio
Built by Buckeye
TRENCHERS, SHOVELS, CRANES
BACKFILLERS, TRACTOR EQUIPMENT

C. S. FOREMAN COMPANY
General Contractors
PIPE LINES
217 Railway Exchange Building
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Extra wells per string

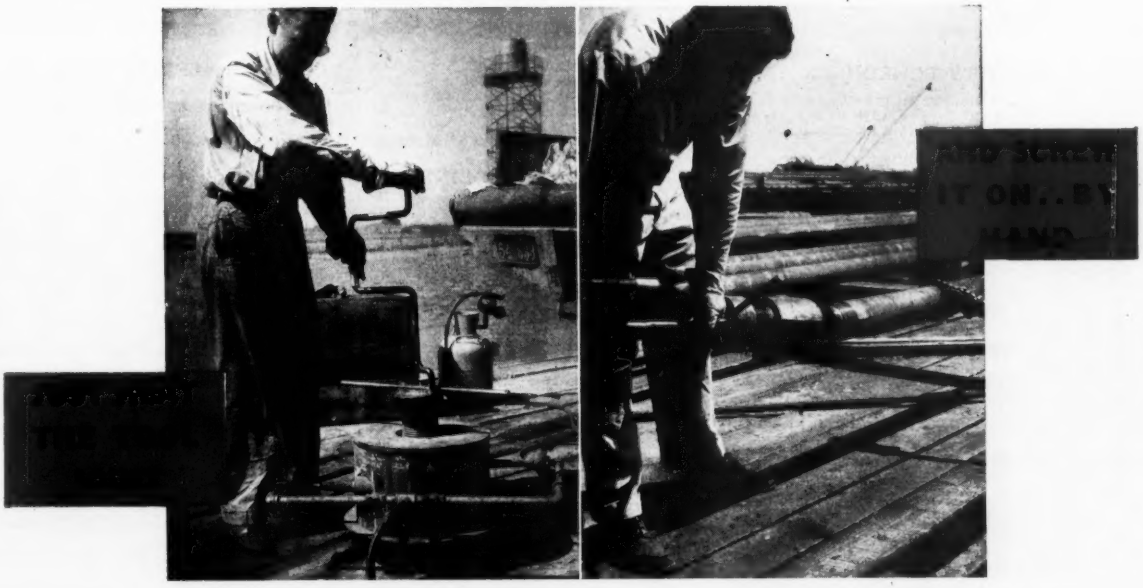
. . . when you specify

REED *Super Shrink-Grip* TOOL JOINTS

HERE'S WHY Reed gives you not only "extra wells per string" but added safety and lower maintenance besides.

YOU GET GREATER PROTECTION against leakage and failure because of ***the double seal:*** 1. **The Shrink-Grip "Safety Area"** which is an extended tool joint counter bore shrunk onto a machined external upset on the drill pipe—protects the drill pipe against bending and failure at the last engaged thread, and provides against leakage. 2. The drill pipe lands against a gauging shoulder within the tool joint, giving assurance of proper make-up when the tool joint is applied to the drill pipe, and providing an added seal against leakage.

YOU GET GREATER ECONOMY because the Reed Super Shrink-Grip Tool Joint can be applied or replaced by hand in the field. Saves shut-down time. Saves long hauls and excessive transportation costs.



ROLLER BIT COMPANY

HOUSTON 1, TEXAS

STATISTICS and

WEEKLY WELL COMPLETIONS . . . WEEK ENDED AUGUST 24, 1946

	Total of all wells					Cum.		Wildcat completions and discoveries					Cumulative total, 1946				
	Comp.	Oil	Gas	Dry	Footage	1946	1945	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
New York	31	16	0	*15	41,987	1,016	921	0	0	0	0	0	0	0	0	0	0
Pennsylvania	76	41	6	†29	116,832	2,563	2,649	0	0	0	0	0	0	0	0	0	0
West Virginia	14	2	9	3	42,894	456	519	0	0	0	0	0	0	0	0	0	0
Ohio	25	9	11	5	62,664	774	599	0	0	0	1	1	2	0	11	25	38
Indiana	8	3	0	5	17,173	230	127	0	0	0	1	1	2	0	0	12	14
Kentucky	14	2	6	6	31,174	318	332	0	0	0	3	3	3	0	0	29	32
Illinois	49	27	1	21	128,302	1,417	1,118	0	0	1	8	9	27	0	1	265	293
Michigan	13	3	3	7	30,297	515	476	0	0	0	5	5	17	0	5	168	190
Kansas	46	24	6	‡16	148,695	1,273	1,081	1	0	0	7	8	20	0	1	167	188
Neb., Mo., Iowa	3	0	0	3	1,290	15	13	0	0	0	3	3	0	0	0	11	11
Oklahoma	68	40	8	‡20	202,832	1,688	1,560	4	0	0	10	14	56	0	28	206	290
Texas	157	91	13	53	710,654	5,138	4,660	6	0	1	32	39	128	21	21	826	996
North Central	39	16	0	23	90,872	1,840	1,406	0	0	0	14	14	36	0	2	342	380
West	37	30	1	6	164,165	1,099	1,190	3	0	0	6	9	33	0	1	113	147
Panhandle	4	0	4	0	12,309	212	366	0	0	0	0	0	0	0	0	5	5
Eastern	30	18	4	§8	162,376	478	208	1	0	0	2	3	11	0	2	58	71
Gulf Coast	33	20	4	9	226,562	1,122	1,056	0	0	1	5	6	30	19	8	164	221
Southwest	14	7	0	7	54,370	387	434	2	0	0	5	7	18	2	8	144	172
Louisiana	21	11	3	7	103,630	846	653	0	1	1	3	5	37	7	7	112	163
Northern	16	7	3	‡6	59,579	473	241	0	0	1	3	4	8	0	2	63	73
Southern	5	4	0	1	44,051	373	412	0	1	0	0	1	29	7	5	49	90
Arkansas	4	4	0	0	12,961	114	117	0	0	0	0	0	5	0	0	25	30
Mississippi	2	1	0	1	14,500	155	237	0	0	0	1	1	1	0	1	42	44
Southeastern States	1	0	0	1	7,510	28	39	0	0	0	1	1	1	0	0	23	24
Montana	6	2	3	1	14,372	195	201	0	0	0	1	1	9	0	1	23	33
Wyoming	7	4	1	2	27,712	113	132	0	0	0	1	1	10	0	3	28	41
Colorado-Utah	2	2	0	0	12,623	91	24	0	0	0	0	0	4	0	0	11	15
New Mexico	12	9	2	1	50,543	241	281	0	0	0	0	0	3	0	0	25	28
California	18	11	0	7	102,383	1,105	1,536	1	0	0	5	6	8	0	3	144	155
Total United States	577	302	72	203	1,881,028	18,291	17,275	12	1	3	82	98	333	28	82	2,142	2,585
Total previous week	511	289	44	178	1,716,538	17,714	16,766	9	0	4	61	74	321	27	79	2,060	2,487
Total Aug. 25, 1945	509	282	47	180	1,682,404			14	0	4	64	82	337	17	92	2,213	2,659

Service wells included: *15, †27, ‡1, §2.

MARKET QUOTATIONS

GRAVITY SCHEDULES

Top prices include all gravities above grades designated, and low prices include all gravities below grades designated:

Gravity—	Signal Hill, Calif.	Oklahoma, Kansas	Gulf Coast Texas	West Tex.*
18-18.9	$1.17	....	....	....
19-19.9	1.21	....	$1.41	$1.05
20-20.9	1.24	$1.20	1.43	1.07
21-21.9	1.28	1.22	1.45	1.09
22-22.9	1.32	1.24	1.47	1.11
23-23.9	1.35	1.26	1.49	1.13
24-24.9	1.39	1.28	1.51	1.15
25-25.9	1.43	1.30	1.53	1.17
26-26.9	1.46	1.32	1.55	1.19
27-27.9	1.50	1.34	1.57	1.21
28-28.9	1.54	1.36	1.59	1.23
29-29.9	1.57	1.38	1.61	1.25
30-30.9	1.61	1.40	1.63	1.27
31-31.9	....	1.42	1.65	1.29
32-32.9	....	1.44	1.67	1.31
33-33.9	....	1.46	1.69	1.33
34-34.9	....	1.48	1.71	1.35
35-35.9	....	1.50	1.73	1.37
36-36.9	....	1.52	1.75	1.39
37-37.9	....	1.54	1.77	1.41
38-38.9	....	1.56	1.79	1.43
39-39.9	....	1.58	1.81	1.45
40 and above	....	1.60	1.83	1.47

*Includes Lea County, New Mexico.

(Quotations shown here are f.o.b. plant in tank cars and in cents per gal. as of last Monday. Crude prices reflect latest 25-cent advance except in California and Pennsylvania where no increase had been made as of Monday morning, July 29.)

REFINERY GASOLINE

Octane (A.S.T.M.)	78-78½†	73-75
Mid-Continent*	7.500-7.750	6.750-7.000
Tex. Gulf Coast	7.250	6.500-6.750
New York Harbor	8.750-9.500	7.750-8.500
California		7.000-7.875

*Basic Oklahoma Group 3. †1939 C.F. R. (research method).

NATURAL GASOLINE

Grades—	26-70	18-55
Oklahoma (Group 3)	4.500	5.400
N. Texas (f.o.b. plant)	4.000	4.800
N. Louisiana (f.o.b. plant)	4.250	5.100
California (averages)	5.500	6.250

CRUDE-OIL PRICES

Representative posted schedules per bbl.

East Texas	$1.60
Kettleman Hills, California*	1.69
Beauregard Parish	1.55
Illinois Basin	1.72
Pecos County, Texas	1.30
Bradford, Pennsylvania	3.35
Eastern Ill., and Western Ind.	1.57

Note: Exclusive of subsidy.
*For 37-37.9 gravity.

A.P.I. REFINERY REPORT

Week ended August 17, 1946
(Figures in thousands of barrels)

	Dly. crude runs to stills	Stocks Gasoline	Distillate	Residual
East Coast	740	22,056	15,975	9,925
Appalachian	165	3,110	609	423
Ill., Ind., Ky.	789	15,571	7,189	4,745
Okla., Kan., Mo.	371	7,740	3,150	1,411
Inland Texas	224	2,605	537	821
Tex. Gulf Cst.	1,241	13,525	7,302	5,450
La. Gulf Cst.	343	4,677	2,667	1,543
N. La., Ark.	61	1,597	477	168
Rocky Mtn.	129	1,506	546	779
California	844	14,649	10,465	26,562
Total 8-17-46	4,907	87,036	48,917	51,827
Total 8-10-46	4,806	87,016	48,030	51,613
Total 8-18-45	5,100	85,983	38,799	45,216

CRUDE-OIL STOCKS

(Bureau of Mines Estimate)

Week ended—	Bbl. of crude*
August 17, 1946	225,583,000
August 10, 1946	224,098,000
August 18, 1945	211,910,000

*Excludes unrefinable Calif. stocks.

TRENDS

DAILY AVERAGE PRODUCTION FOR WEEK

	Aug. 24 crude oil	B. of M. Aug. demand	Aug. 17 crude oil
Alabama	1,050	2,000	1,150
Arkansas	79,950	78,000	79,750
California	872,500	850,000	885,600
Colorado	36,140	30,000	43,400
Eastern	67,500	64,000	64,500
Florida	150	200	200
Illinois	203,800	215,000	204,050
Indiana	18,600	19,000	17,450
Kansas	274,900	260,000	277,450
Kentucky	30,750	31,000	30,500
Louisiana	395,850	380,000	395,600
North Louisiana	92,050	.....	91,800
South Louisiana	303,800	.....	303,800
Michigan	46,509	47,000	47,038
Mississippi	76,600	60,000	71,450
Montana	26,750	24,000	25,040
Nebraska	700	800	750
New Mexico	100,850	99,000	100,850
Oklahoma	384,600	384,000	383,550
Texas	2,119,800	2,120,000	2,119,800
District 1 (Southwest)	19,500	.....	19,500
District 2 (Southwest)	155,100	.....	155,100
District 4 (Southwest)	224,300	.....	224,300
District 3 (Gulf Coast)	486,550	.....	486,550
District 5 (Eastern)	43,050	.....	43,050
District 6 (Eastern)	105,650	.....	105,650
East Texas Field	317,000	.....	317,000
District 7C (West)	27,900	.....	27,900
District 8 (West)	490,600	.....	490,600
District 7B (W. Central)	32,650	.....	32,650
District 9 (N. Central)	132,700	.....	132,700
District 10 (Panhandle)	84,800	.....	84,800
Wyoming	110,910	110,000	111,990
Total United States	*4,847,909	4,774,000	4,860,118

Change from prev. wk., down 12,209

Total production January 1-August 24 ..... †1,116,831,888 bbl.

Same period last year (crude, plus condensate) 1,138,864,525 bbl.

*Not incl. 21,200 bbl. condensate. †Incl. 5,804,000 bbl. condensate.

CRUDE-OIL STOCKS 225,583,000 bbl. as of August 17—up 1,485,000 bbl. One year ago 211,910,000 bbl.

GASOLINE STOCKS 87,036,000 bbl. as of August 17—up 20,000 bbl. One year ago 85,983,000 bbl.

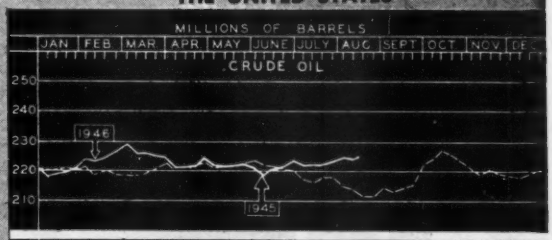
RESIDUAL FUEL-OIL STOCKS 51,827,000 bbl. as of August 17—up 214,000 bbl. One year ago 45,216,000 bbl.

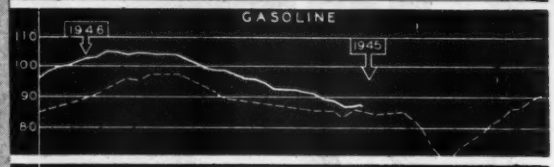
GAS OIL AND DISTILLATE STOCKS 48,917,000 bbl. as of August 17—up 887,000 bbl. One year ago 38,799,000 bbl.

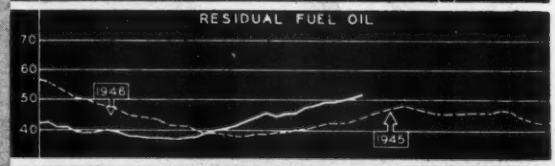
CRUDE-OIL PRODUCTION 4,847,909 bbl. as of August 24—down 12,209 bbl. One year ago 4,888,800 bbl.

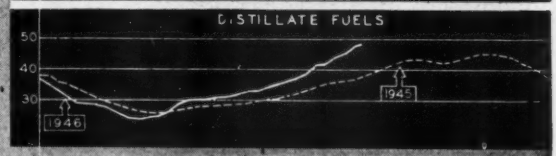
REFINERY RUNS 4,907,000 bbl. daily week ended August 17—up 101,000 bbl. One year ago 5,100,000 bbl.

OIL STOCKS IN THE UNITED STATES

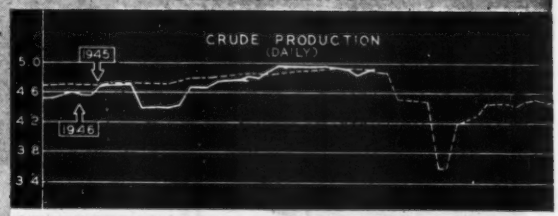


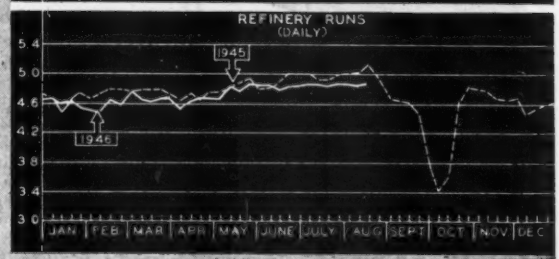




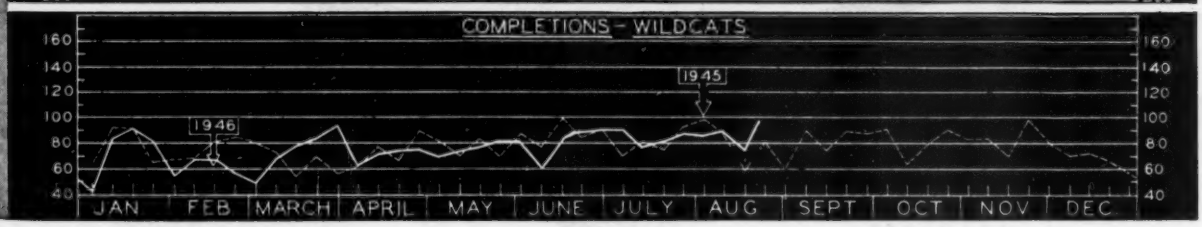


DAILY OPERATIONS





Solid line charts weekly completions, service wells in Eastern area included



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Carbon Steel

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TYPE 30
Carbon Manganese Steel

Recommended for extra heavy pumping conditions, where corrosion is not a factor. CARBON-MANGANESE Steel to special Norris alloy specifications. Very high ultimate tensile strength, yield point and shock resistant qualities. Box & Pin and Double Pin.

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Exploration and Drilling

Navarro Co. Test Has Oil Show

INTEREST in the deep prospects of the East Central Texas area has once again been aroused by indications of oil found in the Temple Hargrove 1 Guy E. Wallace, Navarro County wildcat in the John Jones Survey, 3 miles south of Richland. Several shows of oil were encountered, and drilling was halted at 6,185 ft. in sandy shale after the Travis Peak section, topped at 5,982 ft., failed to yield further shows.

From an elevation of 401 ft., first oil saturation was encountered at 4,440-80 ft., but best indications of production were found in the lower Rodessa zone at 5,444-64 ft. Side-wall cores taken through this latter interval were as follows: 5,450 ft., recovered 2 in. of hard, medium to fine grained, tannish gray, tight to slightly porous, lime sand with spotted stain and odor; 5,454 ft., recovered 4 in. of fine to medium grained dark brown, porous sand which showed good stain and odor even though the core was badly contaminated with drilling fluid; 5,460 ft., recovered 3½ in. of firm, medium grained, dark brown, porous sand with good stain and odor; 5,464 ft., recovered 5½ in. of medium grained, porous sand with streaks of hard limy sand. The top of this last core contained dark stains, while the bottom part contained no stain or odor.

Analysis of the cores showed almost 39 per cent oil saturation, and almost 10 per cent by volume of oil in the sand. Permeability as high as 622 millidarcys was also noted.

In addition to the oil found in the Rodessa section, indications of production were also encountered in the Pettit section at 5,858-5,930 ft. Although core records of this zone are not yet available, the operator considers the shows good enough to warrant carrying the casing string to that depth. There is no Pettit production in Navarro County at the present time, and the nearest Pettit production is found in a well near Fairfield, Freestone County, approximately 20 miles southeast of the 1 Wallace.

Other showings encountered in the Wallace test include brown oil stains at 6,018-27 ft., and gas at 5,396-5,407 ft. The sand at the 6,018-ft. level, however, is considered too tight for production. A 16-minute drill-stem test of the 5,396-5,407-ft. zone, with ¼-in. top and bottom chokes, developed 20 lb. pressure in 16 minutes and a shut-in pressure of 32 lb. When the tool was pulled at the conclusion of the test, 200 ft. of drilling mud and salt water cut with gas was recovered. No oil shows were indicated during the test.

The 1 Wallace is the first deep test to be drilled in Navarro County in nearly 20 years. In a previous attempt to drill a deep test, the same sands were found as have been encountered in the 1 Wallace, but the hole was lost slightly below the 5,000-ft. level and the well was abandoned. Successful completion of the present test would result in considerably increased activity for the area. Even if it should prove dry, it has created sufficient interest in the possibilities of deeper production to warrant a fairly extensive exploratory campaign.

SOUTH LOUISIANA

New Gas-Condensate Sand Found at North Elton

NEW ORLEANS.—A new sand for the North Elton field in Allen Parish has been opened by Lloyd H. Smith 1 William Rees, 23-6s-3w. Drilled to a total depth of 7,615 ft. this well flowed 18 bbl. of condensate per day and 1,320,000 cu. ft. of gas per day through a 10/64-in. choke, tubing pressure 2,300 lb. Production is through perforations at 6,044-46 ft.

A third Wilcox producer for the Mamou field in Evangeline Parish has been completed by Magnolia Petroleum Co. The 1 Walter Reed, which is a north offset to the 1 Morein discovery well and in SW NW 5-5s-1e, flowed a potential of 230 bbl. of high-gravity oil daily through an 8/64-in. choke with 2,850 lb. flowing pressure on the tubing. Production is through perforations in the Wilcox saturated sands from 11,549-69 ft. Saturated section was logged from 11,545-75 ft. Total depth is 12,050 ft. and 7-in. casing is on bottom.

Atlantic Refining Co. 1-A State, wildcat test in Lake Pontchartrain, Township 9s-12e, St. Tammany Parish area on State Lease 318, made two tests for production and developed only a slight blow of gas. The first test was made through 168 perforations at 9,238-77 ft. with no shows, and the second test made through 199 perforations at 8,440-90 ft. developed only a slight blow of gas. Both sets of perforations have been squeezed and another test is being made. Total depth is 11,052 ft. and 5½-in. casing is cemented to 9,370 ft.

Sohio Petroleum Co. will try a test ¼ mile south of the discovery well at Bon Air field in Jefferson Davis Parish. This is on the extreme east side of present production and will be known as 2-A Claudius Fontenot located in SW corner of 15-10s-6w. Contracted depth is 9,800 ft.

There were 20 new locations reported this week, 3 being wildcats, 1 each in Cameron, St. Mary and Terrebonne parishes. Evangeline Parish received three locations while Acadia, Calcasieu, Cameron, Plaquemines, St. Martin and Terrebonne parishes each received two. One new sand was opened in Allen Parish. Acadia, Evangeline and Iberia parishes each received one oil well. One dry hole was completed in Lafourche Parish.

SOUTH LOUISIANA SUCCESSFUL WILDCAT

Allen Parish: New gas-condensate pay, North Elton field—Lloyd H. Smith 1 William Rees, 23-6s-3w, east side of production, TD 7,615 ft., perf. 6,044-46 ft., PT 18 bbl. condensate per day and 1,320,000 cu. ft. gas per day through 10/64-in. choke, TP 2,300 lb., gravity 48°, 6 bbl. of salt water.

TEXAS GULF COAST

Shallow Pay Sand Opened On Flank of Caplan Field

HOUSTON.—A new shallow oil pay horizon is being opened by Johnny Mitchell et al 1 R. P. Smith Unit 21, off the west flank of production at Caplan field in Galveston County. Test is cleaning through a ⅛-in. choke flowing oil and wash water with 450 lb. pressure on the tubing and 550 lb. pressure on the casing, through perforations at 4,031-35 ft. Total depth is 7,800 ft. with 5½-in. casing set to 5,300 ft. On an initial test through casing perforations at 5,232-40 ft. it flowed gas and salt water.

A link well between the producing areas of the Silsbee and West Silsbee fields of Hardin County, American Republics Corp. 2-E E. P. Elliott has been given a potential flow test of 100 bbl. of 41°-gravity oil daily through a ⅛-in. choke with 645 lb. flowing pressure on the tubing and 2,025 lb. casing pressure. Gas-oil ratio is 714 to 1, and is showing 0.2 per cent water. Total depth is 10,702 ft., with 7-in. casing cemented to 8,030 ft. Oil sand was topped at 7,284 ft. Production is through 24 perforations at 7,289-96 ft.

Ohio Oil Co. 1 Kirby, Tract 3, wildcat extension 5,700 ft. southwest of the discovery well for the McCoy field, Liberty County, in James McCoy League, is shut in due to lack of storage space. The well gaged 12 bbl. of 32°-gravity oil hourly through a 10/64-in. choke. Production is through perforations in the 5½-in. casing at 9,136-44 ft. Total depth is 9,773 ft. and 5½-in. casing is cemented to 9,257 ft.

Ten miles southwest of Palacios out in Matagorda Bay, the Salt Dome Oil Corp. 1-157 State of Texas, 1¾ mi. north of the 1-159 State dry hole, is drilling below the 4,500-ft. level. Surface pipe was cemented to 1,049 ft. with 20-in. conductor pipe cemented to 120 ft. It is scheduled to go 6,500 ft.

There were 13 new locations this week, 2 being wildcats, 1 each in Chambers and Wharton counties. Matagorda County received the greatest activity with three lo-

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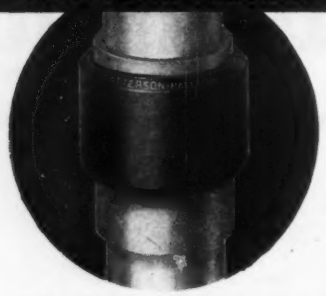

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cations. Four wildcats were completed, all dry, one each in Matagorda and Polk, and two in Fort Bend counties.

UPPER GULF COAST WILDCAT FAILURES

Fort Bend County: Jack W. Frazier and Cecil Hagen 1 Chernosky & Kovar, Big Creek area, Barnabus Wickson Survey, dry, TD 6,745 ft.

W. J. Goldston and Kenneth Owen 1 William Leus, Needville area, D. W. Anthony Survey, dry, TD 6,807 ft.

Matagorda County: Southwestern Oil & Refg. Co. 1 C. T. and L. L. Kountze, I&GN Sur., Sec. 20, 3½ mi. W of Markham field, dry, TD 8,795 ft.

Polk County: Wynn Crosby Drlg. Co. 1 E. I. Duke, in Ace-Schwab area, in Peter J. Menard Survey, dry, TD 8,750 ft.

CALIFORNIA

Oil Discovery Indicated In Gardenia Area

LOS ANGELES.—The Gardena area of Los Angeles County appears this week to have "paid off" in yielding a discovery oil well for British-American Oil Producing Co. and The Texas Co. The new discovery, British-American and Texas Co. 1 Bodger, 22-3s-14w, has not been officially tested but it is credited with flowing considerable oil on a drill-stem test. Operators concede that the well is a discovery of a new pool but declined to speculate on production volume. Liner was being run last week end preparatory to final completion.

The Gardena discovery is bottomed at 9,154 ft. and 8⅝-in. pipe is set at 9,087 ft. When drilling was suspended at total depth the well was reported to be in the schist which is believed to be the source of production.

Previous to last week's performance by the 1 Bodger, the Gardena area had received three exploratory tests. The most recent failure for the territory was Ohio Oil Co. 6-1 Gardena Community, in 24-3s-14w, which was abandoned last December after efforts were unsuccessful in reviving an initial estimated yield of 500 to 1,000 bbl. per day which flowed by heads for a short time. Ohio drilled its first well in the Gardena area in 1930 and carried 1 Fish, 35-3s-14w, to total depth of 7,418 ft. A third exploratory well was drilled by Ohio Oil in 23-3s-14w, designated as 4-1 Gardena Community, but it swabbed salt water at 10,040 ft.

Erratic performance of Ohio 6-1 Gardena Community and its final abandonment after first appearing as a discovery is doubtless the reason why British-American and Texas Co. are unwilling to regard 1 Bodger overenthusiastically until more comprehensive production tests are completed.

Last week's only completed wildcat oil discovery was in the East Mountain View district of Kern County. Here, Cleveland Oil Co. 1 Ten Eyck, 29-30s-29e, flowed at the rate of 1,000 bbl. per day from the upper Transition sand which was topped at 5,221 ft. Operators pinched the well back to a rate of 200 bbl. daily of 29.5°-gravity oil.

Location has been made for a deep test in the Yorba Linda area of Orange County by General Exploration Co. et al for 1 Marshburn near the intersection of Orienta Drive and Palm Avenue in 23-3s-9w. General Exploration is joined by Basin Oil Co., Aero Electric Corp. and C. G. Willis in the operation. Approximately 500 acres have been assembled for the wildcat test.

Eleven locations in the Cymric area of Kern County topped the list of 31 new operations credited last week to California. Standard Oil Co. of California announced six of the new Cymric locations while Superior Oil Co. staked five. The remaining 20 locations were widely scattered. In the previous week, California operators started 46 new wells.

CALIFORNIA SUCCESSFUL WILDCAT

Kern County, Mountain View area: Cleveland Oil Co. 1 Ten Eyck, 29-30s-29e, top Transition 5,221 ft., 7-in. at 5,449 ft., perf. 5,221-50, 5,291-5,300, 5,321-40, and 5,345-51 ft.; potential 1,820 bbl., TD 5,449 ft.

CALIFORNIA WILDCAT FAILURES

Ventura County, Red Mountain area: Continental Oil Co. 2 Casitas, 23-3n-23w, no showings, dry, TD 12,188 ft.

Los Angeles County, Pico area: Union Oil Co. 1 Culp, 7-2s-11w, TD 5,950 ft., PB 1,010 ft., tested dry.

East Los Angeles area: C. G. Willis 1 Simons Brickyard, 15-2s-12w, TD 9,800 ft., tested dry.

Kern County, Grapevine-Tejon area: M. J. Stanbury et al 1 Tejon, 30-11n-19w, TD 3,185 ft., gray sand, top Santa Margarita 3,130 ft., formation test 2,933-72 ft., rec. 120 ft. mud, dry.

Arvin area: Signal Petroleum Co. of Calif., Ltd., 1 Giorgio, 1-31s-29e, top granite 1,482 ft., formation test 1,986-2,031 ft., rec. 20 ft. mud, TD 2,031 ft., dry.

EASTERN TEXAS

Waskom Field Flank Test Flowing 500 Bbl. Daily

DALLAS.—Edgar Johnston 1 G. T. Cargill, Simpson Holloway Survey, on the northwest flank of the Waskom field, Harrison County, has been completed to flow 500 bbl. of 42°-gravity oil through ¼-in. choke in 24 hours on official test. Production is from open hole from 5,931-44 ft. Three miles south, Rogers Lacy 1 Abney, Holloway Survey, was being prepared for dual completion with perforations being made in the Pettit gas zone. On test of the Travis Peak from 6,004-08 ft. the well made 125 bbl. of oil daily.

Humble Oil & Refining Co. 1 C. W. LeGory, Francis Hill Survey, wildcat 3 miles east of Crockett, Houston County, was drilling ahead after a drill-stem test of the Woodbine from 7,326-54 ft. got water. It is reported it will drill to 13,000 ft. to the Edwards lime. Delta Drilling Co. 1 Houston, A. L. Martin Survey, deep test at Martins Mill, Van Zandt County, is drilling below 8,070 ft., believed nearing the massive anhydrite section, after fishing job was cleaned up.

East Texas field, Gregg County, had five completions this week; Hawkins field, Wood County, four; New Hope field, Franklin County, and Carthage field, Panola County, three each, and Manziel field, Wood County, two. Carthage field had three locations, and Manziel field, Hawkins field and Lassater field, Marion County, each had one. Carthage field has 27 drilling wells; Hawkins field, 10; Talco field, Franklin and Titus County, five, and Waskom field, Harrison County; Opelika field, Henderson County; Sand Flat field, Smith County, and Henderson field, Rusk County, each have four.

EASTERN TEXAS SUCCESSFUL WILDCAT

Cherokee County: New oil pool—W. W. Wise and Delta Drlg. 1 J. O. Hugghins, Levi Jordan Sur. A-28, 8 mi. SW Rusk, elev. 388 ft., flowed 90 bbl. day through ⅛-in. choke on tubing, perf. 5,107-16

ft. Woodbine, gravity 41.8°, TD 5,120 ft.

EASTERN TEXAS WILDCAT FAILURES

Angelina County: Tex-Mo Drlg. Co. 1 Long Bell Pet. Co., HT&B Sur. A-349, 3 mi. NE Zavalla, dry in Wilcox, TD 5,028 ft.

Harrison County: Rogers Lacy 1 E. Key, A. Crocker Sur. A-151, 14 mi. S Marshall, elev. 225 ft., Pettit 6,067 ft., Travis Peak 6,392 (?) ft., dry, TD 6,411 ft.

SOUTHWEST TEXAS

Webb County Gets New Oil-Producing Area

CORPUS CHRISTI.—A new oil-producing area in Webb County has been opened by Killam & Hurd 1 J. G. Garcia Heirs, in Block 47, Survey 593, Los Ojuelos grant. Well was completed pumping 109 bbl. net oil per day with 25 per cent water, and gas-oil ratio of 50 to 1. Production is through perforations at 1,872-74 ft. Top of pay at 1,870 ft. Total depth is 1,920 ft. with 5½-in. casing set to 1,919 ft. for completion. Killam & Hurd are starting a second test in the area, 660 ft. southwest of the discovery. The 2 Garcia Heirs is located in Block 47 of Hughes Petroleum Co. subdivision, on a 160-acre lease.

H. R. Smith and W. C. McBride, Inc. 1 E. G. Whitten, Section 153, of the F. Z. Bishop Subd. of Weil Ranch, is a new gas-condensate discovery, in Nueces County, 2 miles northwest of Bishop. This was a deepening job on an old Southern Minerals dry hole, originally abandoned in 1942. Old total depth was 7,506 ft., new total depth 7,873 ft. Production was estimated at 30,000,000 cu. ft. of gas per day open flow, condensate not estimated, tubing pressure 2,500 lb., through a 9/64-in. choke, shut-in pressure 2,725 lb., no water.

A new oil pool for McMullen County, 14 miles southeast of Tilden, has been opened by Dee Davenport 6-A Annie Dolph et al, SE SE Sec. 65, Shumway subdivision of Shiner Ranch, in L. Musquez Survey 12. On potential test the well pumped 5 bbl. of oil per day, no water, from open hole at 1,379-90 ft. Total depth is 1,390 ft.

Sand with oil show was cored above 6,769 ft. at Stewarts and Geo. R. Brown 1 Winona Hall Brinkoeter, located 4,000 ft. southwest of production in the Burnell-Wilcox field, Bee County, a 15-minute drill-stem test at 6,760-69 ft. in the lower part of the sand recovered 150 ft. of oil and 190 ft. of salty water, through ¼-in. chokes, with 300 lb. working pressure. Total depth is 6,810 ft.

Claud B. Hamil 1 Ruth P. Sweatt et vir, wildcat in San Patricio County, about 3 miles northeast of Taft, recovered 100 ft. of oil-cut mud, 700 ft. of pipe-line oil and 360 ft. of salt water on a 15-minute drill-stem test from 5,605-08 ft. Total depth is 5,610 ft. Production string of casing has been set to total depth.

Of the 42 new locations for this week 12 are wildcats, 2 each in Bee and Brooks, and 1 each in Duval, Goliad, Hidalgo, Kenedy, Starr, Willacy, Williamson, and Zavala counties. Tom O'Connor field in Refugio County received seven, Willamar field three locations. There were 34 completions, 21 oil and 3 gas wells, of which 3 were new pool openers, 1 each in McMullen, Nueces and Webb counties. The six dry wildcats are two in Duval, and one each in Bee, Frio, Gonzales, and Guadalupe counties.

SOUTHWEST TEXAS SUCCESSFUL WILDCATS

McMullen County: New oil pool discovery—Dee Davenport 6-A Annie Dolph et al, SE SE Sec. 65, Shumway Subd. of Shiner Ranch, in L. Musquez Sur. 12, 14 mi. SE Tilden and 8 mi. SW Ezzell field, TD 1,390 ft., PT 5 bbl. oil per day on pump, no water, open hole 1,379-90 ft.

Nueces County: New gas-condensate discovery—H. R. Smith and W. C. McBride, Inc. 1 E. G. Whitten, Sec. 153 of F. Z. Bishop Subd. of Weil Ranch, 2 mi. NW Bishop and 3 mi. E Stratton field. Deepening job, old Southern Minerals dry hole, originally abandoned in 1942, old TD 7,506 ft., new TD 7,878 ft., perf. 24 holes 7,038-46 ft., PT: gas and condensate, estimated 30,000,000 cu. ft. gas per day open flow, TP 2,500 lb., on 9/64-in. choke, SIP 2,725 lb., no water.

Webb County: New oil discovery—Killam-Hurd 1 J. G. Garcia Hrs., Los Ojuelos gr., 5½ mi. S Mirando City, 1 mi. E Mirando City field, top pay 1,870 ft., TD 1,920 ft., perf. 1,872-74 ft., PT 109 bbl. net oil per day on pump, gas-oil ratio 50 to 1, gravity 21°, 25 per cent water.

SOUTHWEST TEXAS WILDCAT FAILURES

Bee County: W. C. McBride, Inc. 1 Gus Schultz, T. Molina grant, 5 mi. NE Beeville, dry, TD 3,488 ft.

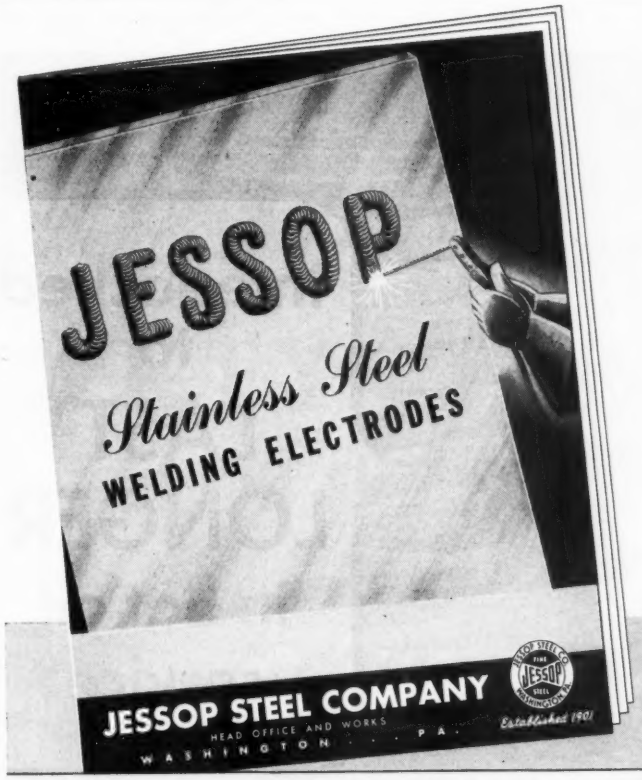
Duval County: John F. Camp 1 J. M. Bennett, CEPI&M Co. Sur. 40, 7½ mi. NW Realitos, dry, TD 3,999 ft.

H. R. Smith and Skinner & Eddy Corp. 1 John F. Sinclair et al, 13½ mi. SE Freer, dry, TD 4,002 ft.

Frio County: Geo. W. Strake, Warren Pet. and Wiegand Bros. 2 Grace Cowden Henry, A. Petra de la Pena Sur. 153, 3 mi. NE Friotown, dry, TD 3,685 ft.

Gonzales County: Southern Minerals Corp. and Santa Clara Oil Co. 1 Octavia Vernor, Daniel McCoy Survey, 5 mi. SW Leesville, dry, TD 4,932 ft.

Guadalupe County: Frank J. Gravis 1 Weyel, E. de los Santos Coy Sur., 3½ mi. NW Marion, dry, TD 2,586 ft.



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PERMIAN BASIN

New Palo Pinto Pool Found in Fisher County

MIDLAND.—Skelly Oil Co. 1-A D. C. Huddleston, Section 11, Block 19, T&P Survey, has been completed to open a Palo Pinto pool 15 miles northeast of Sweetwater in Fisher County. On official test it flowed 802.04 bbl. of pipe-line oil in 24 hours. Production was through 2-in. tubing from open hole between 4,345-4,405 ft. Gravity was 45° and gas-oil ratio was 873 to 1. Casing pressure was 1,215 to 500 lb. and tubing pressure from 600 to 0 lb. The company has staked 3-A Huddleston 1,320 ft. east and 330 ft. north of the discovery well.

Stanolind Oil & Gas Co. 1-GG University, Section 12, Block 39, University Lands, prospective Ellenburger lime pool opener 24 miles northeast of the Todd Deep field, Crockett County, made a 90-minute drill-stem test from 8,330-55 ft. There was a strong blow of air for 47 minutes and an estimated 60,000 cu. ft. of gas. Recovery was 515 ft. of oil and 91 ft. of heavily oil-cut mud. Gravity was 38.8°. On a later 2-hour drill-stem test from 8,355-85 ft. gas came to the surface in 42 minutes, oil in 115 minutes. Eight dry stands of drill pipe were drawn. Then the well unloaded oil. As the remainder of the pipe was broken down, every other stand unloaded oil. Twice the oil shot to the top of the 136-ft. derrick. Final recovery was 7,000 ft. of oil and 7 ft. of sulfur water. Bottom-hole pressure was 3,000 lb. after a 15-minute shutin. Operator will run casing for completion attempt.

Cities Service Oil Co. 1 J. E. Parker, Section 20, Block 44, T-2-S, T&P Survey, deep test 1¼ miles west of the Harper (San Andres) pool of Ector County, after acidizing with 2,000 gal. from 12,455-70 ft. in the Ellenburger, swabbed at the rate of 4 to 5 bbl. oil per hour, with no water. It was reacidized with 7,500 gal. and yielded 161 bbl. of fluid in 11 hours, 96 per cent sulfur water, 2 per cent basic sediment and 2 per cent oil. Operator will squeeze off these perforations and test a sand section in lower part of the Simpson zone.

Fullerton field, Andrews County, and Toborg field, Pecos County, each had three locations this week and Means field, Andrews County, Todd Deep field, Crockett County; Slaughter field, Hockley and Cochran counties, and Sand Hills Tubb field, Crane County, each had two. Keystone-Ellenburger field, and North Monahan field, Winkler County, each had five locations; Block 12 field, Andrews County, four and Howard-Glasscock field, Howard County, and McCamey field, Upton County, each three. TXL field, Ector County, has 31 drilling wells; Fullerton field, 30; Keystone-Ellenburger, 21; Welch field, Dawson County, 8; Keystone-Holt field, Winkler County, 7, and North Goldsmith field, Ector County; Block 31 field, Crane County; Todd Deep field, Martin field, Andrews County, and Keystone-Colby field, Winkler County, each 5.

WEST TEXAS SUCCESSFUL WILDCATS

Andrews County: New oil pool—Texas 1-P State (formerly 1-B University), Sec. 15, Blk. 12, University lands, 19 mi. SW Andrews, elev. 3,295 ft., OTD 4,965 ft., flowed 159 bbl. day through ½-in. choke on 2-in. tubing, perf. 7,170-7,250 ft. Clear Fork, gravity 32.5°, gas-oil ratio 200 to 1, NTD 8,404 ft.

Menard County: New oil pool—Warren Petroleum Co. et al 1 Mrs. Ruby Russell, Sec. 18, S. Wallick Sur., 6 mi. NE Ft. McKavett, elev. 2,165 ft., pumped 21 bbl. day through open 2-in. tubing, perf. 2,254-2,307 ft. Canyon, gravity 32.5°, TD 2,307 ft.

Winkler County: New oil pay—Stanolind 8 Sealy-Smith Foundation, Sec. 48, Blk. A, G&MMB&A Sur., 1 mi. S No. Monahans pool, elev. 2,747 ft., flowed 421 bbl. day through ¼-in. choke on 2-in. tubing, perf. 5,180-5,224 ft. Glorietta, gravity 35.4°, gas-oil ratio 1,216 to 1, TD 5,224 ft.

WEST TEXAS WILDCAT FAILURES

Crane County: Humble 2 G. H. Cowden et al, Sec. 20, Blk. X, CCSD&RGNG Sur., 5 mi. SW Crane, elev. 2,576 ft., Devonian 7,575 ft., Ellenburger 9,927 ft., dry, TD 10,125 ft.

Garza County: Schaefer & Brady 1 Everett, Sec. 14, Blk. 2, H&G& Sur., 15 mi. NE Post, elev. 2,292 ft., Glorietta 2,700 ft., dry, TD 3,517 ft.

Jeff Davis County: H. D. Cornell 1 Eliz. R. Cornell et al, Sec. 24, Blk. 60, T-9, T&P Sur., 6 mi. S Antelope, Trinity 1,780 ft., dry, TD 1,946 ft.

Reeves County: H. W. Snowden et al W. C. Griffin et al, Sec. 25, Blk. C-12, PSL, 9 mi. SW Gomez, elev. 3,719 ft., Delaware 4,150 ft., dry, TD 4,192 ft.

Scurry County: Lion Chem. Corp. 1 F. Strom, Sec. 198, Blk. 97, H&TC Sur., 11½ mi. SW Snyder, dry in Clear Fork, TD 2,903 ft.

Tom Green County: Bennett & Sorrels 1 F. S. Sanders, Sec. 186, WCRR Sur., 4½ mi. E Carlsbad, elev. 2,047 ft., Canyon 4,373 ft., Ellenburger 6,635 ft., dry, TD 6,751 ft.

SOUTHEASTERN NEW MEXICO

HOBBS.—Rowan Drilling Co. and Neville G. Penrose, Inc., 3 Waldon, 15-22s-27e, has been completed to extend the Brunson-Ellenburger pool of southeastern Lea County, 1 mile southeast. Casing was perforated from 7,495-7,565 ft. and swab run. The well kicked off and flowed 27 bbl. the first hour, 31 bbl. the second hour, 27 bbl. the third hour, 31 bbl. the fourth hour and 32½ bbl.

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the fifth hour. Gas-oil ratio was 1,750 to 1. Tubing pressure was 675 lb.

Neville G. Penrose 4-B Elliott, 9-22s-37e, in the Brunson-Ellenburger area, ran a drill-stem test from 7,825-7,920 ft. in the Ellenburger. There was gas to the surface in 6½ minutes and oil in 39 minutes. It flowed 70 bbl. of 42°-gravity oil in 2 hours. The well will be deepened to granite before completion attempt. The test also flowed 32 bbl. of oil in 2 hours on a drill-stem test of the Drinkard pay at 6,550 ft.

Continental Oil Co. 1 Lockhart, 35-21s-37e, on the northeast side of the north extension to the Drinkard field, Lea County, has been completed to flow 1,400 bbl. of oil in 25 hours through perforations from 6,505-30 ft. and 6,540-50 ft. after acidizing with 2,000 gal. Gas volume was 556,000 cu. ft.

Drinkard field, Lea County, had two completions and Paddock and Brunson fields, Lea County, and Grayburg-Jackson field, Eddy County, each had one. Caprock field, Chaves County, had two locations. Drinkard field has 14 drilling wells; Grayburg-Jackson field 13; Square Lakes field, Eddy County, 9; Paddock field 8 and Langlie-Mattix, Brunson and Maljamar fields, Lea County, 4.

ROCKY MOUNTAIN

Testing Continues at Big Sand Draw Prospect

DENVER.—Testing still is in progress in Sinclair-Wyoming Oil Co. 3 Sand Draw Unit, SE SE 10-32n-95w, Big Sand Draw field, Fremont County, Wyoming, which penetrated heavy oil and gas saturation in the Embar formation above the Tensleep sand. Top of the Embar was at 6,645 ft., and 7-in. was cemented at 7,117 ft. Casing was perforated with 392 shots at 6,686-6,735 ft., and well flowed 418 bbl. of 57° gravity distillate and 18,000,000 cu. ft. of gas in 18 hours through a 1-in. choke. In the next 24 hours it flowed 433 bbl. of distillate and 18,480,000 cu. ft. of gas. The well then was shut in for 33 hours to determine bottom-hole pressure. It then flowed 249 bbl. and 15,000,000 cu. ft. of gas in the next 15 hours through tubing choke. In a drill-stem test prior to running casing, the oil tested 36.4° gravity. The well, the third drilled to the deeper horizons, is ½ mile northwest of the discovery in the Tensleep, which had saturation in the Embar on the way down, but did not stop to test. It found the top of the Embar 312 ft. higher on structure than in the discovery.

Rangely field.—Proration of wells in the Rangely field, which was cut from 300 to 275 bbl. per well per day on August 1, again was reduced on August 16, the new allowable for the last half of August being 250 bbl. The cut was due to the increase in the number of producers. It is estimated that 120 wells will be completed and on production by September 1 when another cut in allowable is expected. This is an increase of 20 over the number as of August 1.

Several localized unit agreements have been entered into by operators and royalty owners in various parts of the field. These are confined to comparatively small tracts which offset each other and are so located that they can be operated more economically as units. The unitization of the entire field is considered a complex problem on account of the numerous interests involved, but it is believed that the formation of the local units will later on facilitate such an agreement.

Plans under consideration by the operators for the joint construction of a natural gas-gasoline plant is reported making progress. Phillips Petroleum Co. probably will be the operator of the plant.

Baxter Basin deep tests.—Mountain Fuel Supply Co. 2 Hetzler, SE SE 6-18n-103w, a Tensleep test on the Middle Baxter Basin

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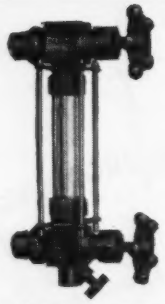

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high, encountered sulfur water in that horizon and was plugged back to the Frontier and completed for 41,352,000 cu. ft. of gas per day. It had the Tensleep at 5,510 ft., and drilled to 5,535 ft. A drill-stem test at 5,515-35 ft., open 40 minutes, recovered 690 ft. of mud and sulfur water. It was then plugged back to 2,380 ft. and redrilled to 2,735 ft., at which depth it was completed in the Frontier. This is the first well to go to the Tensleep close to the top of the middle dome.

Crook's Gap extension. — Sinclair-Wyoming Oil Co. 5 Unit, NW NE 19-28n-92w, Crook's Gap field, Fremont County, Wyoming, nearly a mile to the southeast of the discovery well, is showing for a good producer in the Muddy sand which was topped at 4,890 ft. A drill-stem test at 4,919-63 ft. made gas in 3 minutes, the recovery being 240,000 cu. ft., and filled up with 3,485 ft. of oil and 85 ft. of oil-cut mud in 24 minutes. Four wells have been drilled to the Dakota-Lakota sands, including the discovery, these being offsets. The fifth well is the first out any distance from the top. General Petroleum had a dry hole ½ mile to the east of 5 Unit.

Amsden saturated at Circle Ridge.—Continental Oil Co. 4 Shoshone, SW NW 6-6n-2w, Circle Ridge field, Fremont County, Wyoming, topped the Amsden at 1,080 ft. and is drilling ahead at 1,085 ft., the first 5 ft. showing saturation. Continental has several Tensleep wells producing in the field at shallow depths, and has made several attempts to test the Madison with cable tools, but encountered steep dips and completed the tests in the upper pay. This is the first to get through the Tensleep on the way to the Madison.

New operations. — Fourteen new operations were reported, of which 6 were in Colorado, 5 in Wyoming, two in Montana, and one in northwest New Mexico. One wildcat in Colorado is Yellowbank Oil & Gas Co. 1 State, NW SE NE 26-24s-61w, Yellowbank district, Pueblo County. California Co. had two locations, and Stanolind, Texas, and Idaho-Sharples-Wasatch one each in Rangely. Wyoming locations were one each in Spence, Beaver Creek, Byron and Frannie, and one wildcat, Cities Service Oil Co. 1 Government, SE NE NE 13-51n-93w, North Lamb district, Big Horn County. The last named is 1½ miles southeast of a well abandoned last month by the same operator at 1,540 ft. The Montana locations were one each in Cut Bank and Kevin-Sunburst, and the New Mexico location was in the Fulcher Basin gas field.

Completions.—Eighteen wells were completed, of which 9 were oil wells with initial production of 2,018 bbl.; 6 were gas wells and 3 were dry holes. Colorado had 2 completions, both in the Rangely field, for 554 bbl. initial. Wyoming had seven completions, of which four were oil wells for 1,372 bbl., one was a gas well and two were dry holes. One of the dry holes, however, a wildcat, was dry in the objective, and a gas well in a proven pay. The oil wells were one each at Frannie, Little Buck Creek, Byron and Hamilton Dome for an aggregate of 1,372 bbl. The gas well was at Big Polecat and the dry holes at Zimmerman Butte and Middle Baxter Basin. Montana had two oil completions in Cut Bank for 80 bbl., 3 gas wells and 1 dry hole. New Mexico completions were a 12-bbl. well near Aztec and two gas wells in Fulcher Basin.

WYOMING WILDCAT FAILURE

Middle Baxter Basin, Sweetwater County: Mountain Fuel Supply Co. 2 Hetzler, SE SE SE 6-18n-103w, TD 5,535 ft., top Tensleep 5,510 ft., water, PB to Frontier and completed at 2,735 ft. for 41,357,000 cu. ft. of gas.

MONTANA WILDCAT FAILURE

Button Butte, Fergus County: R. C. Tarrant 1 Woodworth, C SE SW 20-14n-24e, TD 3,600 ft., dry and abd. Madison 3,015 ft.

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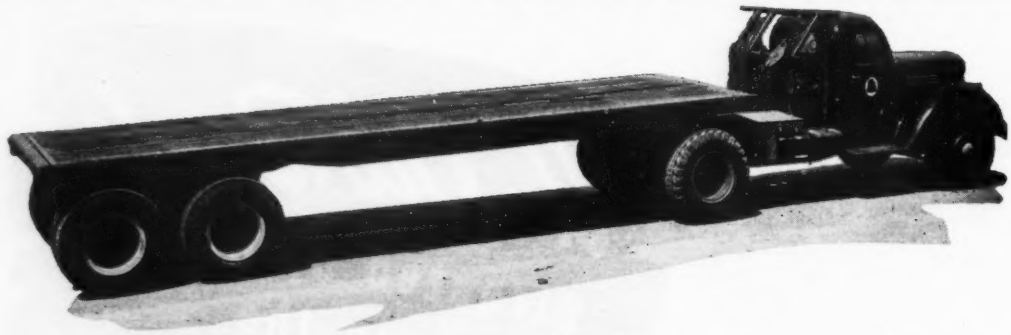

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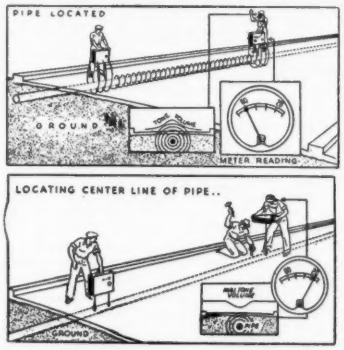

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APPALACHIAN FIELD

August Subsidy Payment Remains Unsettled

PITTSBURGH.—To date no action has been announced by Reconversion Director John R. Steelman to the Reconstruction Finance Corp. as to how much subsidy will be paid for oil produced from stripper wells during the month of August. The result of such dilatory action will be felt by producers of such crude as purchasers of the crude have no means of determining how much per barrel should be paid and consequently checks that should be mailed this week in payment for oil produced during the first half of August will be delayed until the subsidy has been set. To many operators this will work a hardship as they are dependent upon the heretofore regular payments to meet payrolls and other obligations.

In Portland district, Preston County, West Virginia, Wm. E. Snee et al topped the Corniferous chert at 5,575 ft. in No. 3 Harrison Sisler which, from a surface elevation of 2,036 ft., places it minus 3,539 ft., or about 50 ft. lower than the No. 2 which was a small gas well in the Oriskany sand. It is believed, however, that this location and correlation places it on a new fault block.

In the extension to the Elk-Poca field in Kanawha County, United Fuel Gas Co. has three wells in the lower Devonian; No. 5,740 Ego Gallati, Corniferous lime, topped at 5,133 ft. from surface elevation 1,015 ft., or minus 4,118 ft.; No. 783 Ego Gallati, drilled deeper, Corniferous lime 5,300 ft., or minus 4,240 ft.; No. 5,569 Telitha J. Gillespie, Corniferous lime 5,070 ft.

In Tridelphia district, Ohio County, in the Oglebay Park section north of Elm Grove near Wheeling, Cecil Tedrow et al drilled a wildcat to the Injun sand at about 1,200 ft. which after shot is showing for about 2 bbl. a day. This is a rank wildcat and more exploration will have to be done before it can be considered as opening a new pool.

New work consisted of 13 locations and in Kanawha, Lincoln, Mingo, Putnam, Ritchie, Roane, Wood, and Wyoming counties.

In North Strabane Township, Washington County, West Virginia, Charles E. Young completed No. 2 H. A. Walker in the Gordon sand for 40 bbl. a day with the sand 2,545-99 ft., gas and oil 2,573-78 ft., total depth 2,608 ft. The No. 1 on this farm is a small Gantz sand oil well with the Gordon dry.

New locations totaled four and were located in Armstrong, Indiana, Washington, and Westmoreland counties.

N. CENTRAL TEXAS

Jack County Strat Test Recovers Gas From Bend

WICHITA FALLS.—Continental Oil Co. 1-C Tom Cherryhomes, Florida Payne Survey, Abstract 1564, Jack County stratigraphic test 9½ miles southeast of Jacksboro, with elevation of 1,004 ft., topped the Bend comglomerate at 4,574 ft. On a 1-hour drill-stem test from 4,580-4,600 ft. there was gas in 40 minutes. Recovery was 180 ft. of gas-cut mud, no water. It was drilled ahead and logged shaly conglomerate with possible show of oil from 4,600-4,650 ft. Operator will run test from 4,580-4,600 ft. after perforating 5½-in. casing, set at 4,688 ft.

Stephens Petroleum Co. 1 Slusher, Section 2, WCRR Survey, Abstract 2,169, wildcat 9 miles southeast of Jacksboro, ran a 30-minute drill-stem test from 4,537-63 ft. and recovered 210 ft. of oil-cut mud. Electrical survey was run from 4,537-4,600 ft., the total depth. It was swabbing water load to test. There were several good shows of oil in the conglomerate below the top of the Caddo at 4,500 ft.

Standard Oil Co. of Texas 1 A. J. Mitchell, J. B. McNair Survey, deep wildcat 1½ miles northwest of Sherman, was drilling below 11,300 ft. in lime, still above the Ellenburger. L. O. McMillan and Sherman Hunt 1 Ida Thorn, S. Stewart Survey, offset to the recent Grayson County discovery 10 miles northwest of Gordonville, cored from 2,560-69 ft. and recovered 4 ft. of black shale and was drilling ahead at 2,836 ft. in broken shale.

Bateman field, King County; Walnut Bend and Wilson fields, Cooke County, and Hull-Silk field, Archer County, each have one completion. Wilson field had four locations, Electra field, Wichita County, and National field, Wilbarger County, each had three, and Holliday field, Archer County, two. National field has seven drilling wells; Cooper field, Archer County, six; Rose field, Haskell County, and Wilson and Sivell's Bend fields, Cooke County, each four and Cope field, Young County, three.

In West Central Texas, Jones County Regular field had three completions, Eastland County Regular field two and Lewis Steffins field, Jones County; Eolian field, Stephens County, and Stephens County Regular field, each one. Jones County Regular field had two locations and Reddin field, Taylor County, one. Jones County Regular field has five drilling wells; Eolian field, Stephens County, four; Lewis Steffins field, three; Sanders field, Shackelford County; Santa Anna field, Coleman County; Avoca field, Jones County, each two.

NORTH CENTRAL TEXAS WILDCAT FAILURES

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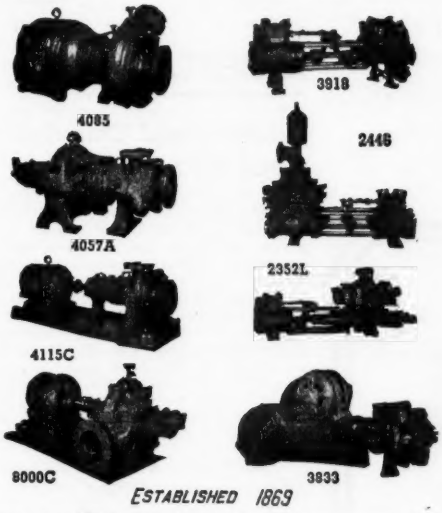

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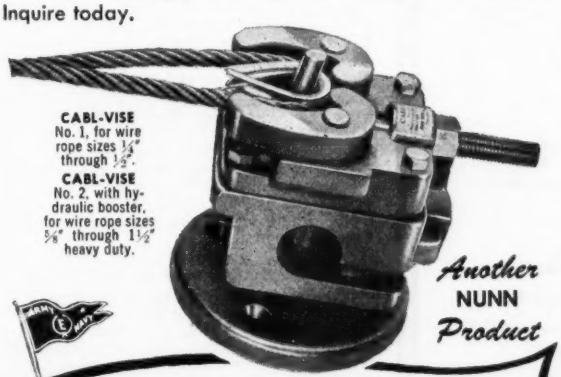

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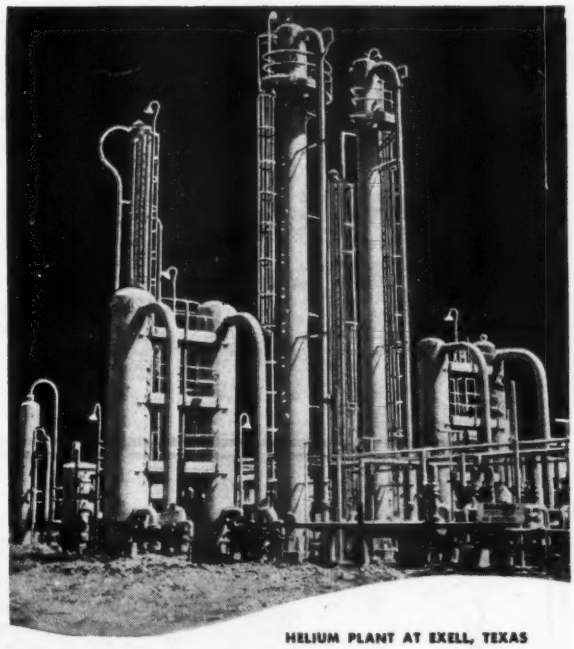

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½ mi. N Huff, elev. 972 ft., Ellenburger 5,587 ft., dry, TD 5,690 ft.

Timberlake & Kelleher 1 Cora M. Jenkins, Blk. 11, South Anderson Ranch Subd., 5 mi. E and 2 mi. S Megargel, dry, TD 1,355 ft.

Cooke County: C. J. Gannon 1 J. O. Carr, Henry Wilkey Sur. A-1090, 1 mi. NW Lindsay, Ellenburger 1,942 ft., dry, TD 2,012 ft.

Denton County: C. A. Lupton 1 E. W. McDonald et al, A. H. Wiley Sur. A-1321, ½ mi. N and 3 mi. E Pilot Point, dry, TD 2,476 ft.

Jack County: Hanlon-Buchanan 3 Mrs. M. E. Munson, TCRR Sur. A-2046, 3 mi. S and 6 mi. E Antelope, elev. 934 ft., dry, TD 604 ft.

Hanlon-Buchanan 1 W. H. Smith, J. Harmon Sur. A-1843, 6½ mi. E and 3½ mi. S Antelope, dry, TD 645 ft.

Montague County:: Bennett & Sorrels 1 C. W. Milton et al, Lot 13, Titus CSL, 4½ mi. S and 1½ mi. E Denver, elev. 992 ft., Caddo 6,060 ft., Ellenburger 7,830 ft., dry, TD 8,017 ft.

Throckmorton County: Paul P. Steed 1 J. C. Mathews, Sec. 224, ETRR Sur., 4½ mi. W and 2 mi. N Ft. Griffin, dry, TD 1,385 ft.

Wilbarger County: A. E. Blair 1 Ira Holt et al, Sec. 26, Blk. 13, H&TC Sur., 1 mi. S and 3 mi. E Harrold, elev. 1,205 ft., dry, TD 2,100 ft.

Young County: Hayden Farmer 1 R. Campbell, Sec. 1452, TE&L Sur., 1 mi. S and 6 mi. E Olney, dry, TD 1,000 ft.

WEST CENTRAL TEXAS WILDCAT FAILURES

Brown County: Looney & Eton 1 B. E. Odcn, A. Arrocha Sur., 2¾ mi. NE Brooksmith, dry in Caddo, TD 505 ft.

Ray Pool 1 A. L. Hogset, Wm. Sharton Sur. No. 318, 7¾ mi. S Blanket, Ellenburger 1,860 ft., dry, TD 1,922 ft.

Callahan County: Boyd Gillespie 1 P. G. Hatchett, Seal & Morris Sur., 2¼ mi. SW Vigo, elev. 1,720 ft., dry, TD 1,005 ft.

Jones County: Andrews M. Howsley 1 J. P. Howle, Sec. 17, Blk. 16, T&P Sur., 3 mi. SE Hawley, elev. 1,668 ft., Flippen 2,095 ft., dry, TD 2,647 ft.

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MICHIGAN

Adams Field Completion Good for 3,000 Bbl.

SAGINAW.—Charles W. Teater's 4 Collins, coming in for an estimated daily potential of 3,000 bbl., natural, in Arenac County's Adams Township field, high-spotted the week in Michigan oil fields as 13 tests were completed and 8 new locations set up. Aside from Teater's big well, there were 10-bbl. completions in Rosecommon and Van Buren counties, 3 gas wells in Newaygo and Osceola counties. Five of the seven dry holes were wildcat tests. New locations were two each in Allegan and Osceola counties, one each in Arenac, Lake, Kent and Van Buren.

MICHIGAN WILDCAT FAILURES

Allegan County, Wayland Township: Fisher-McCall Oil & Gas, Inc., 1 Frank Morganstern, SE SW NW 22-3n-11w, dry in Traverse limestone, TD 1,880 ft.

Bay County, Fraser Township: R. Sternhorst 1 Homer Bishop, SE SW SE 1-16n-4e, dry in Monroe, TD 3,800 ft.

Garfield Township: Fletcher & Leman 1 Bessie Maxson, Tr., NW NE NE 12-16n-3e, dry in Dundee, TD 3,184 ft.

Livingston County, Howell Township: Bridgeport Oil Co., Inc. 1-C C. L. Wilson, NW SE NW 17-3n-4e, dry in Monroe, TD 1,291 ft.

Montcalm County, Home Township: Stewart Oil Co.-Burk White 1 fee, NE SW NE 24-12n-6w, dry in Dundee, TD 3,432 ft.

OHIO, KENTUCKY

Third Large Gasser Finaled In New Columbiana Co. Pool

COLUMBUS.—The third gas well to be drilled in the new Oriskany pool in northeast Madison Township, Columbiana County, Ohio Oil et al 1 Thos. M. Prescott, Section 14, reached the sand at 4,311 ft. and gaged 6,118,000 cu. ft. Rock pressure of the pool is 1,825 lb.

Allen Willey 1 Wm. Bryan, Section 19, Pike Township, Coshocton County, found the Clinton at 3,235-91 ft., with 500,000 cu. ft. gas and a good show oil. The producer is along the south edge of the Five Mile Run pool.

Foraker et al drilled in a Clinton well just southeast of Somerset on T. D. Emmert, Section 10, Reading Township, Perry County, with a natural gage of 450,000 cu. ft. The well is to be shot and tubed.

Drilling a wildcat test in Section 22, Washington Township, Tuscarawas County, Bowman et al struck gas in the Injun while carrying 300 ft. of water. The gas gaged 692,000 cu. ft. 24 hours after drilling in, and is to be tubed and tested.

The location rate remains high with 32 reported for the week. Stewart field reported seven, Sandyville, Cambridge, and Brush Creek each five, and Lancaster and

Ashland four each. Ashland and Cambridge led in completions with five each.

OHIO WILDCAT FAILURE

Ashland County, Lake Township: Ohio Fuel 1 Jesse Workman, Sec. 19, Clinton 2,838-43 ft., TD 2,887 ft.

EASTERN KENTUCKY

ASHLAND. — Pike and Floyd counties came in for peak performances in eastern Kentucky field of operations during the past week, topped by a Shale-Natural completion on the property of W. S. Wells in Pike County. Well No. 81 by Kentucky-West Virginia Gas Co. was at 3,615 ft. with daily open flow of 1,161,000 cu. ft.

Kentucky-West Virginia Gas Co. completed Well No. 5654 on the David Johnson property in Floyd County, total depth 2,371 ft. with an open flow of 569,000 cu. ft. in Big Lime.

Kentucky-West Virginia Gas Co. completed Well No. 609 on the M. A. Davidson property in Floyd County, total depth 1,397 ft., for 328,000 cu. ft. of gas in Big Lime.

Kentucky-West Virginia Gas Co. completed Well No. 5642 on the property of Henry C. Wells Hrs., in Johnson County, total depth of 2,505 ft., for 133,000 cu. ft. in shale, after shot.

WESTERN KENTUCKY

OWENSBORO.—Completions in the Western Kentucky area showed a decided upward trend during the past week as operators finaled two gas wells, two oil wells and six dry holes, three of the latter being wildcats. New operations failed to keep pace with completions as operators announced only four new tests, three in Henderson and one in Union County, all in proved areas.

WESTERN KENTUCKY WILDCAT FAILURES

Daviess County: F. E. Moran et al 1 Pemberton, NE SE NW 5-O-29, dry at 1,940 ft.

Henderson County: Carter 1 J. L. Conley, SW SW NW 10-O-22, elev. 413 ft., dry at 2,745 ft.

Webster County: H. H. Weinert 1 J. W. Nall, 20-M-20, elev. 377 ft., dry at 2,769 ft., Tar Springs 2,033 ft., Glen Dean 2,099 ft., Hardinsburg 2,164 ft.

INDIANA

EVANSVILLE.—A new pool is in prospect for the area just north of the town of Princetown, Gibson County, where the J. C. Haynes et al 2 Crecelius, N½ SW SW 5-2s-10w, encountered good oil saturation in the McClosky lime last week. On a 20-hour test at 2,075-80 ft., the well flowed 50 bbl. natural. It was then shut in and tanks will be erected before further testing. The 2 Crecelius is about 4 miles west of production in the Kirksville and West Francis pools and might start a townsite drilling boom in the town of Princetown. A dry hole one location to the southwest, however, separates the test from the town.

Greenlee & Taliaferro 1 R. M. Gray, NW NW 35-1n-7w, is resetting 5-in. casing at 2,390 ft. after encountering oil saturation in the Devonian lime. Shows were found at 2,575-86 ft. and at 2,615-21 ft., total depth 2,631 ft. This is the deepest test drilled in Pike County in some time and shows promise of opening the first Devonian production in that county.

Indiana completions during the past week showed an upward trend although a large per cent of the wells were unsuccessful. Of eight completions only three produced oil. One dry wildcat was reported. New operations announced during the week included two tests in Gibson County and one each in Pike and Posey counties.

INDIANA WILDCAT FAILURE

Posey County: Jarvis Bros. & Marcell 1 Ed Hanson, SW SW SW 33-4s-13w, dry through McClosky, TD 1,464 ft.

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CANADIAN FIELDS

Depth Record Established By Central Alberta Test

CHATHAM.—In the central Alberta foothills, Imperial-Shell Stolberg 1, LSD 3, 22-41-14w5, has finished drilling at 13,739 ft. to establish a new Alberta, and probably a new Canadian, depth record. The test got the first Madison lime at 12,218 ft., faulted back to Fernie shale at 12,477 ft. and reentered the Madison at 12,827 ft. No information has yet been made public as to whether porous horizons or oil showings have been met in either Madison sequence, the second 912 ft. thick.

Provost.—In the Provost area, eastern Alberta, with Imperial-Provost 1, discovery well, a 31-bbl. producer of 21.5°-gravity oil, drill-stem tests in both Imperial-Provost 2, LSD 1, 33-37-3w4, drilling below 3,606 ft. and Imperial-Provost 3, LSD 6, 27-37-3w4, have failed to indicate commercial production. Both are below the 2,549-ft. producing horizon in the discovery well. Provost 3 has fair gas production.

Steveville. — In the Steveville - Princess field, southeastern Alberta, South Princess Joint Venture C.P.R. 2, LSD 4, 4-19-11w4, is below 3,845 ft. and nearing completion in the Devonian limestone, after encountering what appears to be commercial oil in the Madison. The well is testing a potential southern extension of a field where some Devonian production has already been encountered.

Blackfoot-Ribstone. — Following completion of two wells in the Lloydminster field, eastern Alberta, Lloydminster Oil Producers have moved their drilling outfit to No. 3 location on the Blackfoot-Ribstone anticline, west of Lloydminster and about a mile east and north of No. 1 producer. The Ribstone area, in which several wells secured a small commercial production some years ago, is regarded as a potential extension of the Lloydminster field.

Baxter Lake.—In the Baxter Lake area near Wainwright, Baxter Lake Oils 1, LSD 12, 20-46-5w4, is installing pump after two 12-hour tests each showed 80 bbl. Water content has dropped from 10 to 6 per cent. The 16-gravity crude will be handled by the Gold Standard refinery at Wainwright. A second test is to be drilled.

Pinhorn.—On the Pinhorn Dome, in the border area of southern Alberta, McColl Frontenac-Union Oil 9A-22, LSD 9, 22-3-8w4, which reported initial gas production of 3,500,000 cu. ft. from a sand at 2,394 ft., increased its flow to 46,000,000 cu. ft. after perforating casing in the Bow Island sand. The test was the last of a four-well program launched by the joint interests some months ago. A second four-well program, designed to test the extent of the gas field,

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is being opened with McColl-Union 4-B-20, LSD 4, 20-3-8w4, which has spudded. While there is no immediate market for the gas, the companies are believed to be planning synthetic gasoline production if sufficient reserves can be developed.

KANSAS

Eight New Wildcats Announced During Week

KANSAS exploration work took an upturn last week when locations for eight new tests were disclosed. Operators were confident the new trend would continue. The new work was listed as: Ellis County, two; Graham, McPherson, Ottawa, Pratt, Rice and Stafford counties each getting one location.

In Ellis County, Tom Allan's 1 Pfeifer, SW SW SE 34-13-19w, got under way last week to test the Arbuckle. Location is in the west central part of the county, 4½ miles west of Hays. Nearest production is in the Kraus pool 3 miles to the southwest. It is two miles south of a dry hole drilled by Cities Service Oil Co. in 27-13-19w, which went to 3,825 ft., with no oil shows reported. The new test is based on surface and sub-surface geology.

Leasing in Kansas was said to be declining, with the exception of areas through the central and southern portions, which reported renewals and filings on a good scale. Gulf was said to have renewed some 2,500 acres north of Sharon in eastern Barber County, Township 32s-13w. In central Kansas, Skelly and Continental were reported to have made renewals and picked up a few new leases through Townships 11 and 12s-18 and 19w, Ellis County. J. G. Appleman was reported leading the play on leases lying between the Solomon and Riverview-Haller pools in 11s-19w, and in Reno County, Gulf was holding leaseholds in 25s-9w, near Langdon.

KANSAS SUCCESSFUL WILDCAT

Barber County: Skelly Oil Co. 1 Boggs "C," SW NE NE 17-33s-12w, flowed 45 bbl. of oil per day from Simpson sand at 4,824-42 ft., Lansing-Kansas City 3,860 ft., Mississippi lime 4,412 ft., Viola 4,699 ft., Simpson shale 4,806 ft., TD 4,844 ft.

KANSAS WILDCAT FAILURES

Barber County: J. M. Huber Corp. et al 1 Smith, NW NW NW 7-32s-11w, dry, TD 4,749 ft., Lansing-Kansas City 3,687 ft., Mississippi lime 4,267 ft. with stain at 4,267-80 ft., Viola 4,509 ft., Simpson sand 4,621 ft., Arbuckle 4,739 ft.

Harper County: J. M. Huber Corp. and Kraker et al 1 Misak, NE NE SE 21-34s-5w, dry, TD 5,310 ft., Lansing-Kansas City 3,853 ft., Mississippi lime 4,539 ft., Viola 5,054 ft., Simpson 5,075 ft., Arbuckle 5,292 ft.

Kearny County: Stanolind Oil & Gas Co. 1 Meeker, SW SW NE 36-21s-37w, dry, TD 2,885 ft., Hollenberg 2,646 ft., Herrington 2,684 ft., Winfield 2,782 ft.

Kiowa County: Phillips Petroleum Co. 1 Nora, C SW NW 26-28s-17w, dry, TD 5,202 ft., anhydrite 1,080 ft., Heebner 4,049 ft., Lansing-Kansas City 4,223 ft., conglomerate 4,780 ft., Mississippi lime 4,797 ft., Kinderhook 4,885 ft., Viola 4,915 ft., Simpson dolomite 5,044 ft., Simpson shale 5,078 ft., Arbuckle 5,108 ft.

Norton County: Cities Service Oil Co. 1 Johnson "E," NE SE SE 35-4s-23w, dry, TD 3,765 ft., anhydrite 1,880 ft., Topeka 3,158 ft., Lansing-Kansas City 3,397 ft., La Motte sand 3,704 ft. with a good stain at 3,704-14 ft., granite wash 3,721 ft.

Ottawa County: Central States 1 Central Life, C NW NW 34-12s-3w, dry, TD 3,010 ft., Mississippi lime 2,971 ft.

Rice County: C. U. Bay 1 Myers, C W/2 NW SE 28-20s-9w, dry, TD 3,300 ft., Lansing-Kansas City 2,917 ft., Arbuckle 3,262 ft.

NEBRASKA WILDCAT FAILURES

Holt County: Wynn & Shaver 1 Mallory, C N/2 32-33n-11w, dry, TD 905 ft., Greenhorn 660 ft., Dakota 835 ft., Lakota 900 ft.

Washington County: Ray M. Harrop et al 1 Juckiness, C SE/4 12-19n-11e, dry, TD 150 ft., no tops reported.

MISSOURI WILDCAT FAILURE

Jackson County: Gray et al 1 Gaugh, C W/2 SW NW 24-50n-32w, dry, TD 135 ft., no tops reported.

ILLINOIS

Clay City Outpost Flows 600 Bbl. of Oil Daily

MATTOON.—The A. J. Slagter 1 Russell Pierce, NE NE SE 22-2n-8e, outpost on the eastern edge of the Clay City field of Wayne County, has caused increased drilling activity in the immediate area. The 1 Pierce was completed during the past week for an initial flow of 600 bbl. of oil daily from the McClosky lime at 3,034-50 ft., total depth. Four offsets to this well are now drilling, and others may be started soon.

The Calhoun pool of Richland County, which has yielded some of the heaviest producers in the state during the past few years, was again in the spotlight last week with the largest well in recent weeks. Perry Fulk 1 W. Long, SE SW NE 12-2n-9e, recorded an initial flow of 1,944 bbl. daily from the McClosky lime at 3,144-62 ft., total depth. This well is located on the southwest edge of the pool.

Illinois completions continued their upward trend during the past week as operators finaled 49 wells. Of these 27 produced oil, 1 gas, and 21 were dry. One wildcat was completed successfully as a gas discovery while eight others were dry. New operations announced during the week totaled 43 and included 14 wildcats, 3 in Effingham County, 2 each in Marion and Gallatin counties, and 1 each in Washington, Adams, Clay, Wayne, Fayette, Clark and Cumberland counties.

ILLINOIS SUCCESSFUL WILDCAT COMPLETION

Morgan County: L. Ladet 1 Stenemeyer, NW NW NE 22-13n-8w, gaged 1,700,000 cu. ft. of gas daily, gas sand 250-63 ft., TD 265 ft., shut-in pressure 82 lb.

ILLINOIS WILDCAT FAILURES

Clinton County: Luttrell-Everhardt 1 Carter, NE NW NW 21-1n-1w, dry, TD 1,631 ft., Ste. Genevieve 1,562 ft., McClosky 1,602 ft.

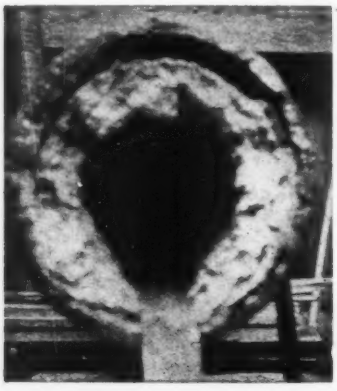
Crawford County: National Association 1 E. G. Stifle, NW SE NE 6-6n-11w, dry, TD 3,281 ft., Ste. Genevieve 1,508 ft., Devonian 2,871 ft.

Cumberland County: National Association 1 Seegers, SW SW SW 2-9n-7e, dry, TD 2,490 ft., Barlow lime 2,067 ft., Benoist sand 2,249 ft., Ste. Genevieve 2,355 ft., McClosky 2,400 ft.

Effingham County: Ben Taylor 1 V. Schmidt, SE SE SW 28-7n-7e, dry, TD 2,882 ft., Ste. Genevieve 2,760 ft., Fredonia 2,784 ft., McClosky 2,790 ft.

Edwards County: Chandler & Fisher Oil Co. 1 Bunting, CN½ NW SE 33-1n-10e, dry, TD 3,435 ft., Cypress sand 2,962 ft., Benoist sand 3,131 ft., Aux Vases 3,253 ft., Fredonia 3,357 ft., McClosky 3,369 ft.

Hamilton County: Aetna Oil Co. 1 Batchelder, NW SW NW 5-4s-7e, dry, TD 2,515



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ft., Cypress sand 3,026 ft., Aux Vases 3,294 ft., McClosky 3,427 ft.

Texas Co. 1 Wm. Bennett, SE NW NW 27-5s-5e, dry, TD 3,519 ft., Cypress sand 2,962 ft., Aux Vases 3,249 ft., McClosky 3,392 ft., slight show oil at 3,259-65 ft.

Jefferson County: E. J. Rumwaldt 1 W. J. Hynes, NW SW NW 28-2s-2e, dry, TD 2,710 ft., Aux Vases sand 2,530 ft., Ste. Genevieve 2,572 ft., McClosky 2,644 ft.

OKLAHOMA

Viola Lime Production Opened at North Lindsay

IF current reports concerning the Frank Russell 1 Sandburr, NE NW NE 22-5n-4w, a tight hole ⅝ mile northeast of production in the deep North Lindsay pool, prove correct, a new reservoir, the Viola lime, will be added to that pool. Latest reports indicate that the well was brought in flowing 65 bbl. an hour through ½-in. choke from perforations opposite the Viola. Only other information released so far is the total depth of 11,510 ft. and the fact that 5½-in. casing is cemented at approximately 11,150 ft.

The 1 Sandburr is also believed to be potentially commercial in the Bromide zone. Several unsuccessful efforts were made to test this zone before backing up to the Viola. Other sands in the field which have shown promise of commercial production in various wells are the Hunton lime and possibly the McLish.

Oklahoma Natural Gas Co.'s deep test in eastern Dewey County, the 1 Oakwood Unit, NW NW NW 6-17n-14w, has encountered the first Wilcox sand at 12,420 ft. Drilling was halted at this depth to pull the tools but will be resumed when the trip is finished. Previous tops included the Viola at 12,120 ft. and the Bromide at 12,270 ft. Several shows of oil and gas were encountered in the Pennsylvanian sands at intervals during drilling, and the Owsego lime at 9,476-9,500 ft. showed 500,000 cu. ft. of gas with a little distillate in the mud.

OKLAHOMA SUCCESSFUL WILDCATS

Hughes County: Midland Co-Op 1 Williams, SW NW NW 6-7n-9e, flowed 4 bbl. of oil per day from Booch at 2,773-97 ft., brown lime 2,586 ft., coal 2,757-63 ft., TD 2,819 ft.

Lincoln County: Danciger Oil & Refining Co. 1 Pantlick, NW NE SW 15-12n-5e, pumped 408 bbl. of oil per day from Wilcox at 4,534-44 ft., 25° gravity, discovery well, Layton 2,285 ft., Cleveland 2,580 ft., Oswego 3,420 ft., Verdigris 3,550 ft., Red Fork 3,760 ft., Inola 3,895 ft., Mayes 4,060 ft., Woodford 4,225 ft., Hunton 4,285 ft., dolomite 4,503 ft., TD 4,533 ft.

Seminole County: Gulf Oil & Refining Co. 1 Remaklus, SW SW NW 17-10n-7e, flowed 1,101 bbl. of oil per day through a 2-in. tubing choke from Gilcrease at 3,726-49 ft., discovery well, sand 2,125 ft., Oswego 2,425 ft., Earlsboro 3,242 ft., Inola 3,565 ft., TD 3,846 ft.

Winona 1 Coessee, NW NE NE 27-9n-5e, flowed 82 bbl. of oil per day from Earlsboro at 3,487-93 ft., 40° gravity, discovery well, Wewoka 2,455 ft., Calvin 2,800 ft., Thurman 3,263 ft., Woodford 4,025 ft., Sylvan 4,140 ft., Viola 4,230 ft., Wilcox 4,319 ft., TD 4,332 ft.

OKLAHOMA WILDCAT FAILURES

Comanche County: G. C. English 1 Coldren, SW NW NW 15-1s-13w, dry, TD 2,709 ft., Canyon 2,519 ft., granite 2,620 ft.

Cotton County: J. W. Hastings, Jr. 1 Holman, NE SW NW 14-3s-11w, dry, TD 2,000 ft., broken sand and shale 1,370-1,470 ft., lime 1,784-87 ft., sand 1,900-5 and 1,914-30 ft.

Creek County: J. G. Buell 1 Donaldson "A," SW NE SW 4-14n-8e, dry, TD 2,555 ft., Cleveland 1,388-97 ft., Verdigris 2,410 ft., Skinner 2,489 ft.

Gillespie & Son and Eason Oil Co. 1 Gaasch, NE NE NW 22-14n-9e, dry, TD 3,751 ft., Big lime 1,868 ft., Oswego 2,020 ft., Bartlesville 2,475 ft., Pitkin 3,105 ft., Mayes 3,385 ft., Sylvan 3,637 ft., Viola 3,693 ft., Wilcox 3,742 ft.

H. M. Haverbeck 1 Kimble, NW NW SW 22-14n-10e, dry, TD 3,300 ft., Bartlesville 2,200 ft., Dutcher lime 2,740 ft., Wapanucka 2,795-2,860 ft., Woodford 3,225 ft., Misener 3,256 ft.

Garvin County: Jordan Petroleum Co. 1 Carroll, C SE NW 36-2n-1w, dry, TD 5,622 ft., Sylvan 4,730 ft., Viola 4,894 ft., first Bromide sand 5,514-44 ft., second Bromide sand 5,584-5,618 ft.

Hughes County: Texas Co. 1 Adams, NW NW SW 24-8n-9e, dry, TD 3,686 ft., brown lime 2,440 ft., Gilcrease sand 3,035 ft., Cromwell 3,542 ft.

Kiowa County: J. P. Ledford 1 Edna Evans, SW SW SW 8-7n-16w, dry, TD 2,372 ft., no tops reported.

Pontotoc County: V. L. Crowell 1-A Harris, NW NE NE 8-5n-6e, dry, TD 2,251 ft., no tops reported.

Seminole County: F. T. Haddock and M. E. Gaskill 1 Harrison, SE NW NW 19-7n-6e, dry, TD 4,401 ft., Layton 1,325 ft., Thurman sand 3,000-35 ft., Mayes 3,820 ft., Woodford 3,940 ft., Sylvan 4,113 ft., Viola 4,197 ft., dolomite 4,243 ft., second Wilcox 4,392 ft.

LA.-ARK.

North Louisiana Wildcats Hold Interest

SHREVEPORT.—Progress at three wildcats was closely watched by operators in the North Louisiana area. In Caddo Parish, six miles northwest of Shreveport, Kerr & McGee Oil Co.'s 1 H. Johnson was drilling ahead at 4,600 ft., with no indications of production as yet reported. Operators were said to have no contract depth but would test deeper horizons if conditions are warranted.

In DeSoto Parish, about 6 miles southwest of Mansfield, Jarvis, Shoemaker and Marcell's 1 Hames, 4-11n-14w, was drilling below 4,456 ft. Hope was held out here for possible distillate production at the same level of the field opened west of Mansfield.

Other wildcats reports of last week included: Madison Parish; Murphy-Sun Oil Co. 1 Lylah E. Clark, 17-17n-12e, dry at 5,810 ft. Caddo Parish: Joe Burnham's 1 Noel, 11-19n-16w, drilling below 5,042 ft. Richland Parish: Hurley, David and Demoles 1 Singer, 21-18n-9e, dry at 4,013 ft.; Roy L. Fisher 1 Robinson, 13-17n-7e, drilling below 2,720 ft. Franklin Parish: Murphy-Sun Oil Co. 1 McAllister, 17-17n-10e, moving in materials; same operators 1 Hole, 32-16n-8e, drilling below 3,501 ft.; C. H. Murphy 1 Doris Robinson, 21-13n-7e, drilling below 6,000 ft.; Atlas Oil & Refining Co. 1 Ayer Timber Co., 26-14n-9e, moving in rig.

NORTH LOUISIANA SUCCESSFUL WILDCAT

Richland Parish: Kingwood Oil Co. 1 Sayre, C SE SE SW 34-17n-7e, flowed 1,150,000 cu. ft. gas through ¼-in. choke from Tuscaloose at 2,598-2,601 ft., chalk 2,576 ft., Lower Cretaceous 2,610 ft., TD 3,430 ft.

NORTH LOUISIANA WILDCAT FAILURES

Caddo Parish: Kirby Petroleum Co. 1 Ledbetter, NE SW SW 4-22n-15w, dry, TD 3,741 ft., Arkadelphia 1,192 ft., Nacatoch sand 1,340 ft., Saratoga 1,748 ft., Base Annona 2,156 ft., Buckrange 2,377 ft., Lower Cretaceous 2,755 ft., Glen Rose 3,556 ft.

Richland Parish: Fisher-Hutchins 1 Tensas-Delta, C NW NE SE 20-14n-6e, dry, TD 5,049 ft., Wilcox 1,460 ft., Midway 2,870 ft., Clayton 3,425 ft., Eagleford sand 3,518 ft., Tuscaloosa 4,070 ft., Massive sand 4,850 ft., Paluxy 4,881 ft.

Humphrey-Wynne 1 M. B. Boughton, NE SW 1-15n-6e, dry, TD 3,606 ft., Wilcox 1,162 ft., Midway 1,990 ft., Tuscaloosa 2,498 ft., Lower Cretaceous 3,185 ft., Glen Rose 3,383 ft.

MISSISSIPPI

Sulfur Tests Expected to Uncover New Salt Domes

JACKSON.—Several permits to drill sulfur tests throughout Mississippi have been requested: the Sippiala Corp., formerly known as the Exploro Corp., and as the Minsearch Corp., has requested 12 permits, 3 of which were taken on the flank of the Arm Dome in Lawrence County; 4 permits in Covington County, and 5 in Forrest County have been requested and it is expected that these tests for sulfur will lead to discovery of 2 new salt domes. Other operations for the state include 58 active field wells, 5 new field locations, 18 active wildcats with Humble Oil & Refining Co. staking this week's only new wildcat location, the 1 J. F. Fowler, 27-2n-14w, Lamar County.

In Brookhaven field, Sun Oil Co. 1 Leon Case, 17-7n-7e, Lincoln County, encountered oil shows in the Case sand zone at 10,302 ft. after taking side-wall cores, and is drilling beyond 11,043 ft., and in Cranfield field, Gulf Refining Co. 6 Ella G. Lees, 71-7n-1w, of Adams County, continues testing after flowing 684 bbl. of 38.3° gravity oil per day on a 10-hour test.

Highlights of this week's wildcat drilling activity are: Superior Oil Co. 1 Cassie Bradford, 1-3n-13w, Forrest County, which is drilling below 12,999 ft.; Humble Oil & Refining Co. 1 E. L. West et al, 18-9n-7w, Wayne County, coring ahead below 8,500 ft., and I P. LaRue 1 W. R. Barnhill, 21-8n-9w, Wayne County, preparing to core at 6,028 ft.

MISSISSIPPI WILDCAT FAILURE

Madison County: The Salt Dome Oil Corp. 1 E. S. Mansell Unit, NW NE 25-11n-4e, dry, TD 4,826 ft., Wilcox 1,054 ft., Midway 2,900 ft., conglomerate 3,647 ft., shaly sand 4,650-62 ft.

FLORIDA WILDCAT FAILURE

Dixie County: Stanolind and Sun Oil 1 Perpetual Forest, Inc., NW NW 5-11s-11e, dry, TD 7,510 ft., dolomite and gypsum 1,942-2,002 ft., dolomite and anhydrite 2,002-38 ft. and 2,070-2,110 ft.

CALENDAR

September

Houston Nomads, Old College Inn, Houston, September 9.

Sixth annual Appalachian Gas Measurement Short Course, West Virginia University, Morgantown, W. Va., September 9-11.

American Chemical Society, semiannual meeting, Chicago, September 9 to 13.

Pacific Coast Gas Association, annual convention, Fairmont Hotel, San Francisco, September 10-12.

Fourth National Chemical Exposition, sponsored by Chicago section, American Chemical Society, Coliseum, Chicago, September 10-14.

Los Angeles Nomads, Mayfair Hotel, September 11.

Texas Railroad Commission state-wide allowable hearing, Austin, September 13.

National Petroleum Association, forty-fourth annual meeting, Hotel Traymore, Atlantic City, N. J., September 16-20.

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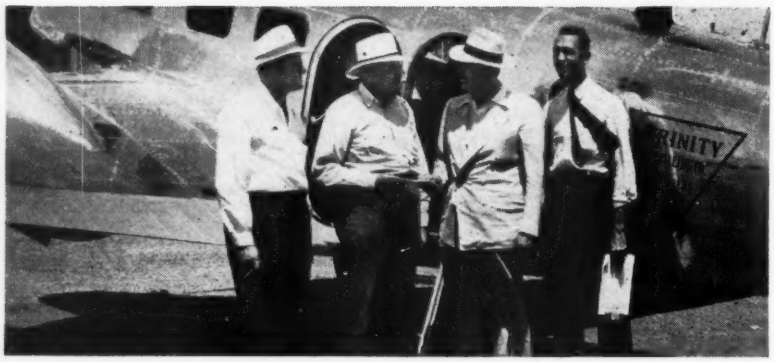
Drilling Contractors



The drilling industry, with its far-flung operations, is finding the airplane of great value and convenience, according to the Rush brothers of Trinity Drilling Co., Dallas, Tex. Above, left to right: Ralph L. Rush and Joe L. Rush accept registration papers on their new all-metal twin-engined Beechcraft from Jim Gray, Dallas Aircraft Sales, Inc. On the right is Larry Parish, who will pilot the plane for Trinity

Hewgley Drilling Co. holds contract for Humble Oil Refining Co.'s 1 Lake Crescent Farms, in NW NE 8-11s-28e, a wildcat in Flagler County, Florida.

Harold F. Westcott, contractor for Faultline Oil Corp. at its 1-A Fant, SW SW NE 27-10n-2w, was drilling below 5,755 ft. early this week. The well will test the east flank at the south end of the old Moore field in Cleveland County, Oklahoma.

Delta Drilling Co., Tyler, Tex., has contract for L. B. Benton and W. J. Weaver 1 W. D. McKenzie, a 6,500-ft. wildcat in the J. P. Wood Survey, 2 miles northeast of Alba, Wood County. The company also has an interest in the well.

Morris & Meredith, Inc., of Houston, has contract to drill an 11,000-ft. test for Tide Water Associated Oil Co. on their Gust Goeckler 1 in the Ramsey area of Colorado County. Same operators are rigging up on a 9,000-ft. wildcat test for Brown and Wheeler of Fort Worth; their 1 Lamar Folda, in Nueces County.

General Petroleums of Calgary have the contract for completion from 1,692 ft. of the unfinished Arrow-Brazeau 1, LSD 5, 9-41-15w5, on the Nordegg structure in the central Alberta foothills. A group of Alberta companies are backing completion of the test. Same operators have spudded Admiral-Superior 1, LSD 2, 9-1-17w4, for a group of independent companies. The well will test holdings of 1,760 acres near Hay Lake, in the border area of southern Alberta. Test is deepening after setting 10-in. casing at 202 ft.

Conway Drilling Co. has contract for Delta Drilling Co.'s 1 J. H. Gauntt, James Giles Survey, scheduled Paluxy wildcat 2½ miles west of Simms, in Bowie County.

Roeser & Pendleton holds contract on Sun Oil Co.'s 1 Case, 17-7n-7e, in

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the Brookhaven field of Lincoln County, Mississippi. Reports last week placed the operation at 10,835 ft., drilling in hard shale and sand.

Olsen-Blount Drilling Corp., Oklahoma City, last week were in lime and shale below 5,965 ft. at Stanolind Oil & Gas Co.'s 1-A Replogle, NW SW 27-13n-4w, West Edmond field, Oklahoma County, Oklahoma.

Wheless Drilling Co. will drill Atlas Oil & Refining Co.'s 1 R. A. Wynns in SW SW 8-16s-19w, on the southeast edge of the Stephens field northwest of Columbia County, Arkansas. Contract depth was said to be around 5,500 ft., or to the Cotton Valley zone. Operators will use a portable rig.

Delta Drilling Co. finished up at its 1 Gauntt, a wildcat in the James Giles Survey, west of Simms in Bowie County, East Texas, and was skidding rig for a new test. The 1 Gauntt was dry at 3,716 ft.

Arrow Drilling Co. is contractor for Magnolia Petroleum Co.'s 2 Hearne, in T. V. Walker Survey. Location is in the Opelika field, Henderson County, East Texas.

Swarthout Brothers set surface pipe and changed to cable tools last week at the 1,350-ft. test of C. R. Jernett and Ed Findley. The wildcat, 1 John F. Goodman, is in the O'Campo Survey, southwest of Waco. Objective is the Glen Rose zone.

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Washington, 25, D. C. Notice is hereby given that sealed bids will be received until 1 P.M. Wednesday, September 11, 1946, for land described herein situated within the known geologic structure of the Kern River oil field, M.D.M., California. This land is offered to qualified bidders of the highest cash amounts per acre as a bonus for the privilege of leasing the land under section 17 of the leasing act as amended by the Act of August 21, 1935 (49 Stat. 673, 30 U.S.C. sec. 226), in the following parcels: Parcel No. 1, T. 28 S., R. 27 E., sec. 24; N½SE¼, 80 acres. Parcel No. 2, T. 28 S., R. 28 E., sec. 18, NE¼, 160 acres. Total 240 acres. Bids must be submitted on each parcel separately; but if both parcels are awarded to the same bidder, they may be included in a single lease. Each bidder must submit with the bid one-fifth of the amount bid in cash, or by certified check, made payable to the order of the Treasurer of the United States, and file the showing of qualifications to receive a lease, required under 43 CFR 192.19. The envelopes should be plainly marked, "Bid for Parcel No.... Kern River oil field, California. Not to be opened before 1 P.M. September 11, 1946." No bids received after the hour fixed herein for submitting bids will be considered. The remainder of the bonus and the annual rental at the rate of $1 per acre must be paid and a $5,000 corporate surety bond must be furnished by a successful bidder prior to the issuance of a lease. The deposits of the other bidders will be returned upon acceptance of the successful bids. The successful bidder will be required to agree not to discriminate against any employe or applicant for employment because of race, creed, color, or national origin, and to require an identical provision to be included in all subcontracts. Bidders are warned against violation of section 59, U. S. Criminal Code, approved March 4, 1909, prohibiting unlawful combination or intimidation of bidders. The right is reserved to reject any and all bids. Fred W. Johnson, Director.

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That's one time to take every possible precaution, and the simplest, surest, low-cost method you can follow is to use Baker Casing Centralizers on the shoe joint, and on a joint or two above. The casing is centered in the hole so that cement slurry can get all around it, and you know the odds are with you to get a sound "first-time" cement job. Call any Baker man and he will see that you are supplied promptly with . . .

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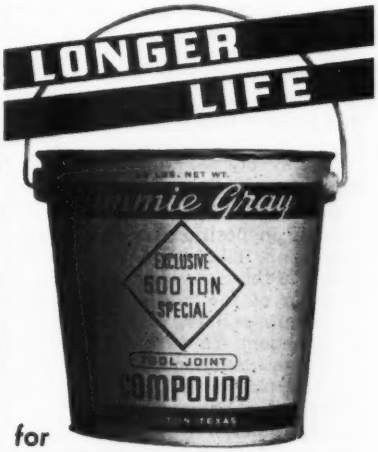

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PERSONALS

California Standard Official Began in El Segundo

SOME 33 years ago, Francis H Smith left his job in Greeley, Colo., and headed for the California Coast where he started "at the bottom" with Standard Oil Co. of California. According to an article in the Standard Oiler, any work in an oil refinery appealed to him more than continuing as a laboratory inspector in a sugar refinery. His first job must have tried his determination—he was blueprint boy at the then recently completed El Segundo plant.

However, between 1913 and 1928 he rose in position rapidly, being in succession, laboratory inspector, operator in the experimental laboratory, foreman of the lubricating-oil treating plant, refiner, and assistant superintendent. In 1928 he was transferred to Richmond as superintendent, a position he held until 1934, when he became manager of the Richmond refinery.

Smith held this position for 10 years when he was called to the home office in San Francisco as assistant general manager of the manufacturing department. A year later he was made general manager of operations of the manufacturing department.

Stuart Noland, Skelly Oil Co. geologist, has been transferred from Midland, Tex., to Abilene, Tex., where they will open a new district office.

Gavin R. Taylor, vice president in charge of the refining department of McColl-Frontenac Oil Co., Ltd., has been elected a director of the company.

G. H. Michler, southern European marketing division advisor, Standard Oil Co. (N.J.), is now in Europe on a business trip.

Aubrey T. Gholson, sales manager for Hovey Petroleum Co., has been elected vice president of the company.

P. C. Spencer, general counsel of Sinclair Oil Corp., has been appointed a member of the American Petroleum Industries Committee of the American Petroleum Institute. Spencer succeeds the late Grattan T. Stanford, who was also general counsel for Sinclair.

Lloyd Gaston Smith has resigned as president and general manager of Lago Oil & Transport Co., Aruba, to join the foreign refining coordination department of Standard Oil Co. (N. J.). **John J. Horigan,** a director of Lago, a Jersey affiliate since 1942, succeeds Smith.

H. C. Rothe, manager of the engineering division at the Lubrite refinery of Socony-Vacuum Oil Co., Inc., at East St. Louis, Ill., has been transferred to the New York refinery engineering division.

L. E. Barrows, manager of the production department of The Texas Co., and his assistant, **A. R. Wilson,** Houston, are in Colorado inspecting the company's operations, including Rangely field where it has 4,360 acres in leases and 16 producing wells.

G. J. DeJong, Shell Chemical Corp., engineer at Shell Point, Calif., has been promoted to an assistant department manager. **A. T. Stewart,** junior chemist, and **E. S. Templeton,** assistant department manager, have been promoted to technical assistant and assistant chief chemist, respectively, at Houston.

T. S. Scibienski and **John F. Lynch,** with La Gloria Corp., Corpus Christi, Tex., for the past 2 years, have recently been elected vice presidents. Lynch also represents La Gloria as a director on the board of Carthage Hydrocol, Inc., of New York. **John J. Sheerin** has resigned as vice president but will continue as a director, and **E. C. Will,** who also resigned as vice president, will remain with the company as a consultant.

Robert J. Gutru, geologist for Cities Service Oil Co., has been transferred from Mount Pleasant, Mich., to Amarillo, Tex. **W. F. Brinker,** formerly at Casper, Wyo., has replaced Gutru at Mount Pleasant.

Edgar Kraus, former regional geologist with Atlantic Refining Co., Dallas, has been named to head the geological section of the company's exploration and development department in Dallas.

J. S. Knopp, marine representative for Socony-Vacuum Oil Co., Inc., at Port Said, Egypt, is in the United States for a 3 months' visit. He arrived aboard the tanker S. S. Yellow Tavern which brought Gulf Oil Corp. the first Middle East crude shipment to the United States.

Frank E. Packard, general attorney for Standard Oil Co. (Ind.) is to retire September 1 after more than 25 years' service with the company. He is also chairman of the central division of the American Petroleum Industries Committee and is noted for activities in the field of gasoline taxes and petroleum industry laws.

S. G. Loy, assistant controller of Humble Pipe Line Co., has been elected president of the Houston Control of the Controllers Institute of America. Other Houston officers include: **E. C. Breeding,** controller of The Texas Co., vice president; **D. R. Boggs,** chief accountant of Standard Oil Co. of Texas, secretary-treasurer; and **H. L. Smith,** secretary and treasurer of The Texas Co., director. **E. Clyde Seymour,** controller of Magnolia Petroleum Co., has been elected president of the Dallas Control of the organization. **J. Norvelle Walker,** vice president and controller of Royal Oil & Gas Corp., Philadelphia, has been elected president of the institute's local in that city. Other oil-company officials elected directors of local controls in their respective cities included: **A. W. Hair,** division controller of Socony-Vacuum Oil Co., Inc., Kansas City, Mo.; **William A. Jackson,** assistant controller of Standard Oil Co. (N. J.), New York; **E. S. Worthington,** secretary and treasurer of Wofford Oil Co., Atlanta, Ga.; **R. P. Schwalbach,** comptroller of Wadhams Oil Co., Milwaukee; and **F. S. Slick,** assistant comptroller of Ohio Oil Co., Toledo, Ohio.

William Millard, representing a group of independent oil operators, is in Bogota surveying Colombian production operations.

J. O. Bower, general manager of Texas Petroleum Co. in Colombia, left recently for a vacation in the United States.

John Darden, independent oil operator, has moved his headquarters from Lubbock, Tex., to Midland, Tex.

Lynn G. Smith, Bradford, Pa., has been elected a director of South Penn Oil Co.

E. H. Soper, geologist for The Texas Co., has been transferred from Midland, Tex., to Shelby, Mont.

W. Earle Shamblin, former district geologist for Devonian Oil Co., is now with Deep Rock Oil Corp. at Shreveport, La.

T. S. Edrington and **Wallace Wilgus** have joined Shell Oil Co., Inc., in the West Texas area as district geophysicist and geologist, respectively.

Paul H. Farmer, geologist, has joined Brinkerhoff Drilling Co. at Evansville, Ind.

W. T. Hoey has been appointed district geologist in the Permian Basin for Plymouth Oil Co. He formerely was liaison geologist for Stanolind Oil & Gas Co.

R. T. Chapman has succeeded **C. A. Cole,** now with The Trowbridge Sample Service, as district geologist for Stanolind Oil & Gas Co. at Shreveport, La.

W. H. Farrand, assistant manager of foreign production of The Texas Co., and **Fred Briggs,** equipment engineer, are making an inspection trip of Texaco's Colombian operations, in company with **J. K. Hufendick,** assistant manager of Texas Petroleum Co., Colombian subsidiary.

Elmer W. Ellsworth has been appointed assistant business manager of the American Association of Petroleum Geologists. He was recently released from the Army as a lieutenant colonel after 4 years' service. Prior to entering the armed forces he maintained a consulting geological office in Centralia, Ill.

Henry F. Pelkey has been named assistant to Creole Petroleum Corp.'s Vice President **H. F. Prileau.** Pelkey will continue to handle public relations in the New York office and related matters in addition to his new duties. He has been associated with Standard Oil Co. (N. J.) and affiliates for the past 25 years and has spent much of this time in South America.

W. E. Blackman, geologist with Barnsdall Oil Co. at Midland, Tex., has resigned from the company.

T. C. Twyman has been elected an executive vice president of McColl-Frontenac Oil Co., Ltd.

Rene Roussin, chief of Casabe district operations for Schlumberger Well Surveying Corp., arrived in Bogota recently from Venezuela.

John H. Melvin, former geologist and treasurer of the Pennsylvania Drilling Co., has been appointed district geologist for the U. S. Engineer office at Omaha, Neb.

James D. Smullen has been promoted from acting head to assistant in charge of the oil, gas, and rate division in the office of the attorney-general of Texas.

Theodore A. Werkenthin, principal material engineer of the rubber and plastics section of the U. S. Bureau of Ships, has been awarded the Meritorious Civilian Service award for outstanding service in connection with research on synthetic rubber.

Luis B. Ortiz, who recently contracted with Colombia's comptroller general to complete and publish a study of the living costs and conditions of oil workers there, has been invited by the Venezuelan Government to carry out a similar study in that country and plans to leave Bogota shortly for the Maracaibo area.

E. L. Barringer, Chicago, has recently joined the editorial staff of Fleet Owner, New York, as editor. Barringer formerly was managing editor of Chek-Chart Corp., Chicago. For several years prior to this position he was a member of the public relations staff of Ethyl Corp., and is well known in the engineering and research organization of that company and in the oil and automotive industry.

J. P. Allen, technical assistant in charge of the catalytic cracking plant of the Baltimore, Md., refinery of Standard Oil Co. of New Jersey, has been promoted to general foreman of the cracking department, and **William Muly** has been named unit foreman of the catalytic cracking and light-ends units. Other promotions include **Gilbert E. Filler,** appointed unit foreman of the thermal cracking and naphtha rerun units and **Herbert E. Wilhelm,** named a general foreman. **William J. Sheridan,** process control engineer, has been appointed assistant head of the technical department at Baltimore.

SHIFTS—

H. H. Rushing, superintendent, Rocky Mountain Drilling Co., Fillmore, Calif., to Lyman, Wyo.; **Hugh Neumeyer,** superintendent, Cron & Gracey, Texarkana, to Longview, Tex.; **C. B. Rinehart,** geologist, Continental Oil Co., Jacksboro, Tex., to Ponca City, Okla.; **A. L. Cunningham,** engineer, Magnolia Pipe Line Co., Kennedy, Tex., to Waskom, Tex.; **J. M. Wear,** superintendent, The Texas Co., Conroe, Tex., to El Campo, Tex.; **L. G. Wells,** superintendent, P. G. Lake, Inc., Overton, Tex., to Longview, Tex.; **A. H. Crouch,** engineer, Arkansas Louisiana Gas Co., El Dorado, Ark., to Little Rock; **W. W. Rand,** geologist, Shell Oil Co., Inc., Tallahassee, Fla., to Houston; **Wesley K. Rickel,** engineer, Amerada Petroleum Co., Hattiesburg, Miss., to Port Gibson, Miss.; **Stuart G. McArthur,** president, Georgia Oil & Gas Co., Laurel, Miss., to Hattiesburg, Miss.; **J. Clifford McClure,** engineer, Cities Service Oil Co., Russell, Kans., to Great Bend, Kans.; **William L. Giezentanner,** engineer, Stanolind Oil & Gas Co., Henryetta, Okla., to McAlester, Okla.; **G. A. Bridges,** engineer, Phillips Petroleum Co., Bartlesville, Okla., to Copan, Okla.; **J. H. Marsee,** engineer, Phillips Petroleum Co., Oklahoma City, to Kaw, Okla.; **Alvin E. Straub,** engineer, Cities Service Oil Co., Seminole, Okla., to Odessa, Tex.

Don Blackstone, former division geologist for Carter Oil Co., has accepted a teaching position at the University of Wyoming.

Dwight F. Benton, assistant general manager of sales for the Rocky Mountain Division of Standard Oil Co. (Ind.) is to be transferred October 1 to assistant general manager of the lubricating and sales technical service departments in the Chicago office.

J. G. McMillan, district landman of Stanolind Oil & Gas Co. at Midland, Tex., has left the company to become an independent operator. **George Mahaffey,** assistant division landman in Oklahoma City, will replace him. **Charles F. Schock,** district landman at Jackson, Miss., will succeed Mahaffey.

Dr. Ralph W. Stone, assistant state geologist for Pennsylvania, has been appointed state geologist. He succeeds **Dr. George Ashley** who is retiring after 27 years service. In addition to his work as state geologist, Dr. Ashley is well known in the field of oil conservation and for his work in promoting many conservation projects. He has also been state geologist of Indiana and Tennessee, and is a member of several scientific societies, including the Topographic and Geologic Survey of Pennsylvania which he founded and has directed since 1919.

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Will carry 600 cows or run 1,000 steers
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Purchaser gets the ranch equipment

This ranch has plenty of power. It offers ease of operation. It's a healthy, happy place to live. It's a sound business investment. If it's your size, it's the ranch you want. Write us for full particulars. If you would like a smaller or a larger ranch, tell us what you are looking for. We have many splendid ranches on our list.

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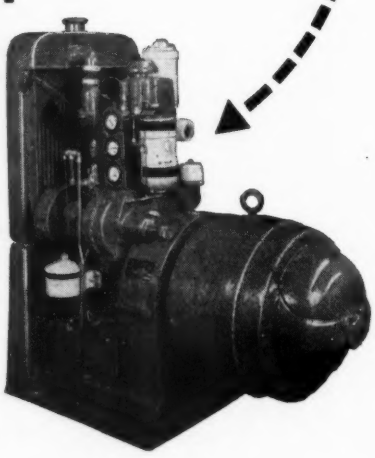

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Equipment Men in the News

Wilby Named Vice President Of U. S. Steel

ARTHUR C. WILBY

Arthur C. Wilby has been elected vice president of United States Steel Corp. of Delaware, Benjamin F. Fairless, president, announces. Wilby, who has been associated with United States Steel since January 9, 1909, will maintain his headquarters in Chicago.

Wilby was appointed manager of public relations for Carnegie-Illinois Steel Corp. January 1, 1937. At the same time and until 1939, he also was in charge of the liquidation of surplus properties belonging to United States Steel subsidiaries. Since July 5, 1938, he has been in charge of public relations for United States Steel subsidiaries in the Chicago district.

Conaway Succeeds Belcher As Dallas Manager

Walter E. Belcher, manager of the Dallas district of New York Belting & Packing Co., has been placed on the retirement list

W. E. BELCHER

J. E. CONAWAY

after 51 years with the company. He will be succeeded by J. E. Conaway of Memphis, who has been an assistant to Belcher. Before his appointment to the Dallas managership in 1921, Belcher had served the company in Houston, New Orleans, and Boston.

As manager of the Dallas district Conaway will have supervision over sales in Texas, Louisiana, Mississippi, Arkansas, New Mexico, southeast Kansas, Oklahoma and western Tennessee.

Fort Worth Bank to Open Suburban Institution

Interests associated with The Fort Worth National Bank have announced a new suburban bank to be known as the West Side State Bank. It will have a capital of $125,000, surplus $100,000, and undivided profits $25,000, or total capital funds of $250,000.

Officers will be E. E. Bewley, president; C. F. Fry, vice president; and Phil Tillery, cashier.

Slater Heads Tank-Car Sales

American Car & Foundry Co. announces that R. S. Slater has been appointed manager of tank-car sales. He will be in charge of sales of tank cars, storage tanks, and pressure vessels. Slater will continue to make his headquarters in New York.

Atwell Heads New England District for Dresser

DANIEL J. ATWELL

Appointment of Daniel J. Atwell as New England district manager for the sale of Dresser products to the gas industry has been announced by H. Z. Hight, sales manager. Atwell will cover New Jersey and all of the New England states from the New York office of the Dresser Manufacturing Division located at 122 East 42nd Street. Before joining Dresser, Atwell was associated with Pittsburgh Equitable Meter Co.

Erle Zoll Heads Chicago-Wilcox

Chicago-Wilcox Manufacturing Co., Chicago manufacturers of gaskets, announces the appointment of Erle J. Zoll as president of the 40-year-old organization. Zoll has been associated with Chicago-Wilcox for the past 29 years handling sales. In addition to his new duties as president, he will continue to be in charge of sales for the company.

Other officers of the corporation include R. B. Anthony, chairman of the board; H. B. O'Brien, secretary; and R. B. Anthony, Jr., treasurer.

McNiece Gets New Post With Allis-Chalmers

Irwin McNiece has been named assistant district superintendent of service and erection for the Los Angeles district of Allis-Chalmers Mfg. Co., Milwaukee, according to Leon A. Watts, general superintendent of service and erection for the company. McNiece joined Allis-Chalmers in 1912, coming from the old Telluride Power Co. During the last 3½ years he has been working on Allis-Chalmers marine programs in Seattle, Tacoma, and Portland shipyards.

Chek-Chart Names Two

Appointment of Lew J. Franek as production manager has been announced by Ray Shaw, president of The Chek-Chart Corp. During the 5 years preceding his connection with Chek-Chart, Franek has been a consultant to printing and publishing houses.

The company also announces the appointment of Christy C. Butterworth as managing editor. A graduate of the U. S. Naval Academy at Annapolis, Butterworth has had a wide practical experience in industrial and automotive lubrication.

Johnson Transferred to Chicago For J. F. Pritchard & Co.

Karl Johnson, sales engineer representing all divisions of J. F. Pritchard & Co., has recently been transferred to the firm's Chicago office from Tulsa. Johnson has been employed by Pritchard since January 1, shortly after he received his discharge from the Navy. His experience includes a year with a consulting engineering firm in Kansas City, and 2 years with Westinghouse Electric Corp.

Spring Winding Machine Now in Production

Leonard N. Walters, Tulsa, owner of the newly organized Walter's Spring Winding Co., has announced that his new spring winding machine is now in production by a local manufacturing plant.

"With the use of this machine, one can make various sizes and types of small wire springs in just a few seconds, and we are greatly encouraged by the enthusiastic approval shown by users since it was first placed on the market a few weeks ago," Walters reported. "The machine is of especial value to engineers and electricians who often need to make quick replacements of broken springs," he stated.

Chiksan Purchases Stock of Well Equipment Manufacturing Corp.

Chiksan Co., Brea, Calif., announces the acquisition of The Well Equipment Manufacturing Corp., Houston, through the purchase of all the corporation's common stock. Operation of the corporation will be continued as a wholly owned subsidiary of Chiksan under the direction of the following officers: W. Edgar Spear, president; H. J. Hagn, vice president and general manager; G. R. Winder, vice president and sales manager; J. H. Robinson, secretary and treasurer, and T. T. Word, Jr., assistant sales manager.

NEW MACHINES INSTALLED AT AMERICAN

Installation of new gun-boring machines, for boring of drill collars and kellys, has just been completed at American Iron & Machine Works Co. in Oklahoma City. This new equipment is said to insure a straight, accurate bore hole. Also installed by American is a new thread miller for milling threads on drill collars and kellys

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AUTOMATIC INJECTORS

The accepted method for assuring an uninterrupted supply of feed water to oil field boilers. Penberthy Automatic Injectors will supply feed water to boilers at minimum cost, are quickly and easily installed, reliable under most severe operating conditions, require little attention and no careful handling. Highest quality design and rugged construction.

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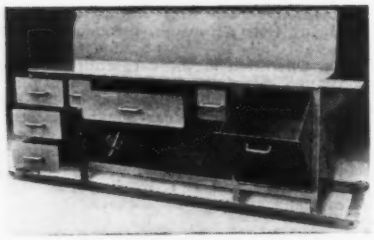

PLENTY OF STORAGE ROOM

There's space in this all-steel, all-welded bench for **all** the hand tools on any drilling rig. Six big drawers and a rag bin, with a total of over 14 cubic feet of storage space, plus the tool pegs on the back apron, provide room for protecting all tools against loss or damage.

Buy one for each rig you own... and they'll pay for their cost in the savings they effect.

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Field Tests Offered for Corrosion, Erosion, Liquid Level, Dezincification

Sam Tour & Co., Inc., engineers, metallurgists and consultants, with offices and laboratories at 44 Trinity Place, New York, announces an extension of facilities for research and for field service to industry.

Trained service engineers are available to handle such equipment as the Penetron and Probolog in order to develop substantial economies which proper use of it affords, and interpret findings efficiently. Alexander Gobus, vice president, who has a wide reputation in nondestructive testing has been placed in charge of the service.

Caterpillar Appoints Four

Appointment of three district representatives and one field engineer has been announced by James A. Gibb, assistant manager of the export sales department of Caterpillar Tractor Co., Peoria.

Albert C. Kraft has been named to serve Algeria, French Equatorial Africa, French West Africa, Morocco, and Tunisia; Oscar von Seeger to serve in Sweden with his territory to include Denmark, Finland, and Norway; and Ed E. Chaudoin to serve in the Philippines and from there to serve all areas of the Far East from Manchuria to the Netherlands East Indies, including China and Siam. George S. Sylvester will serve as a field engineer assisting district representative R. E. Hill in northern Brazil.

CONTINENTAL SUPPLY CO. HOLDS ANNUAL PICNIC

Top: Mrs. F. M. Mayer, F. M. Mayer
Center: Mrs. R. W. Keith, R. W. Keith, T. D. Collins, N. A. Endicott, Elaine Endicott
Bottom: C. N. Swanson, Miss Jeanne Swanson, Rudy Swanson, Mrs. C. N. Swanson, Mrs. F. I. Brinegar, F. I. Brinegar

Continental Supply Co. held its annual picnic August 7, at the Glen Lakes Country Club, Dallas.

Athletic and sporting events were arranged for the entire personnel, including golf, soft ball, and fishing. There was bridge, pinochle, gin rummy, and bingo. Suitable prizes were awarded to the winners in each contest.

Barbecue chicked dinner was served to more than 400. Dancing in the club house included a jitterbug contest.